VOL. LXXXII. No. 2097. [All Rights Reserved.] FEBRUARY 1, 1918. [Registered at G.P.O. as a Newspaper and Canadian Magazine rate of Postage.] PRICE FOURPENCE.

LONDON: PUBLISHING OFFICE, 4, LUDGATE HILL, E.C.4. SUBSCRIPTION per annum. Postage included to Great Britain, £1 1s. 6d. Canada, £1 2s. 10d. ($5.80); to all other countries, 30s.—NEW YORK: D. VAN NOSTRAND CO., 25, Park Place, N. TORONTO: GORDON N. McLEAN, 347, Yonge St. TORONTO. ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. PARIS: BOYVEAU & CHEVILLET, Librairie, Etrangère, 22, Rue de la Banque.
Telegraphic Address: "Ageekay, Cent., London." A B C Code. Telephone Nos. City 997; Central 4425 (Editorial only).

LITHOLITE, Ltd.,
55—57, Hackney Grove, London, E. 8.
'Phone and Telegrams: Dalston 592, London.
MANUFACTURERS OF
MOULDED INSULATORS,
FIREPROOF AND OTHER GRADES.
ESTABLISHED NEARLY 20 YEARS.

AIR COMPRESSORS & VAC. PUMPS, Desiccators Sets. Cable Pumps & Impregnators.
NORMAN DICKSON, PRINGLE & Co.
25, Victoria St., Westminster.

WRIGHT 'Phone: 499. Tel.: Motor.
A.C. and D.C. **MOTORS.**
WRIGHT & WOOD, Ltd., HALIFAX.

EVERY DESCRIPTION OF
SMALL TURNED PARTS and CASTINGS for ELECTRICAL ENGINEERS.
A. MORTON,
6, Tenby Street North, Birmingham.

BROOK MOTORS.
E. Brook, Ltd.,
Empress Works, HUDDERSFIELD.
11, Queen Victoria St., LONDON, E.C.4
See Advertisement, Sup. 42.

SWITCHGEAR.
ERNEST F. MOY, LTD.,
Manufacturing Electrical Engineers and Government Contractors,
GREENLAND PLACE, CAMDEN TOWN, LONDON.

TAYLOR & CO.
MICA & MICANITE
Speciality:—Plates for high resistance.
Telephone:—CENTRAL 4575.
40, HATTON GARDEN, LONDON, E.C.

Osram, Mazda, Wotan, "Z" and other Coalescence Lamps. Pocket Lamps, Torches, Batteries, &c.
E. DAWSON & CO. (W. E. POTT).
24, GRAY'S INN ROAD, London, W.C. 1
Telephone: HOLBORN 2784.

CHURTON
SINGLE and POLYPHASE
MOTORS.
T. HARDING CHURTON & CO., LTD.,
Atlas Works, Water Lane, LEEDS.

LIFTS and - - - TRANSPORTERS.
Wm. WADSWORTH & SONS, LTD.
BOLTON.

"EMPIRE"
AUTOMATIC CONTROL
FOR
Shell Presses, Compressors, Machine Tools.
ELECTRIC CONTROL, LIMITED, GLASGOW.

WESTERN-ELECTRIC
COMPANY, LIMITED,
Norfolk House, Victoria Embankment, W.C.
Works: NORTH WOOLWICH, LONDON, E.
TELEPHONES & CABLES.
See Advertisement last week, Sup. 10.

CONNOLLY BROS., Ltd.,
for
WIRES AND CABLES.
See Advertisement this week, p. iii.

WHITE
Electrical Instrument Co.
2, 4, & 6, GLOUCESTER ST.,
CLERKENWELL, LONDON, E.C.
Wire: Voltograph, London. 'Phone: City, 8660.

LANGDON - DAVIES
ELECTRIC MOTORS.
One, Two and Three-Phase.
LANGDON-DAVIES MOTOR CO.,
110, Cannon Street, London, E.C.

INSULATING - - BEADS - -
Immediate Delivery.
HOLDER-HARRIDEN LTD., 35/37, Noble St., London, E.C.

V.I.R. Cables.—Price Alteration.
If you are in the Trade, write to JOHNSON & PHILLIPS, LTD., Charlton, London, S.E. 7, for their Revised Booklet of Data and Net Prices. It will save your time.

Better than Rubber, Leather and Gutta-Percha.
BELTING.
DERMATINE
DERMATINE CO., Ltd.,
Neate St., London, S.E. 5

LARGE STOCK KEPT FOR QUICK DELIVERY
SHUNT REGULATORS,
MOTOR STARTERS and all classes of Resistance Work.
The SOLENOID REGULATOR Co. (GEORGE A. YARWOOD Proprietor),
HIGHGATE SQUARE, CAMP HILL,
Telephone: Midland 888. BIRMINGHAM Telegrams: "Solenoid, Birmingham."

MAVOR & COULSON, Ltd.,
GLASGOW.
MOTORS, DYNAMOS, SWITCHGEAR.

ELECTRIC MOTOR REPAIRS
ARMATURES REWOUND.
H. DUNN & SON,
Newington Causeway,
Tel.: Hop 1167. LONDON, S.E. 1

THERMIT, LIMITED,
(Proprietors: THE BIRMINGHAM METAL & MUNITIONS CO., Ltd., BIRMINGHAM)
675, Commercial Road,
LONDON, E. 14.
'Phone: EAST 4157. 'Grams: "FULMEN, STEP, LONDON."

START LIGHT.
THE
WOODHOUSE AUTOMATIC CLUTCH
PICKS UP LOAD AFTER STARTING.
THE VICTORIA DYNAMO & MOTOR CO.,
CRAVEN HOUSE, KINGSWAY, W.C. 2.

INGLEBY & CO., LTD.
ELLAND ROAD, LEEDS.
MOTORS FOR DIRECT AND ALTERNATING CURRENT
Tel. 378
Delivery from Stock up to 50 H.P.

Advertisement Index, see page xxviii.

ENGLISH EDISWAN EVERYTHING ELECTRICAL

The house of Ediswan is the best equipped to deal with all enquiries for

Everything Electrical.

ENTIRELY BRITISH.

The Edison Swan Electric Co., Ltd.
PONDERS END, MIDDLESEX.
London and Provincial Depots.

EYES OF YOUR WORKERS

determine quality of work in proportion to condition. Wrong sources of light and improper diffusion cause eye-strain, nervous breakdowns, and impaired production.

It is imperative at the present juncture that the maximum of production be secured with the least fatigue—an absolute impossibility with defective lighting arrangements.

Our Works Reflector (No. 530) projects the light rays on to the work—increasing illumination 50% to 100% just where needed.

Designed for throwing the light from above the normal line of vision, it ensures, by reason of its scientific construction, an illumination equal to daylight: thus adapting all available light to the needs of vision, obviating stress on the worker, and being the indirect cause of better and greater production.

Details of this and other types of Workslite Reflectors free on request to—

The Wardle Engineering Co., Ltd.,
Illuminating Engineers,
196, Deansgate, MANCHESTER.
London Office: 25, VICTORIA ST., LONDON, S.W. 1.
We. T. 2

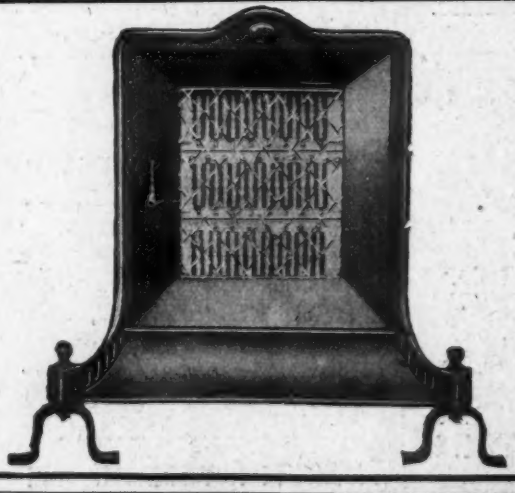
CASH BUYERS
SCRAP
IRON, STEEL,
ALSO
TURNINGS, BORINGS, &c.

ENQUIRIES SOLICITED.

A. WEBSTER,
Great Western Railway Depôt,
PARK ROYAL,
LONDON,
N.W.

CASH BUYERS
SCRAP
COPPER, BRASS, GUN-METAL,
Also Borings, RESIDUES, &c.

TELEPHONE WILLESDEN 2378.



THE
ARORA ELECTRIC FIRE

Has given universal satisfaction.

WHY? Because OUR patented Element is of HEAVY SECTION and has LOW Current Density, yet it GLOWS at a HIGH TEMPERATURE.

Low Price, Robust, Cheery, Economical.

Write for List E (Fires & Cookers) to Sole Manufacturers:

THE ARORA CO., Loughborough.
(Proprietors: Messrs. Hoer & Co., Ltd.)

VULCANISED FIBRE.

DIAMOND FIBRE TRADE MARK

In Sheets, Rods, Tubes, and Special Shapes.
Horn Fibre, Diamond Insulation, Press Board, Fuller Board, &c.

DIAMOND STATE FIBRE CO., 57, OLD ST., LONDON, E.C.

THE

ELECTRICAL REVIEW.

VOL. LXXXII. FEBRUARY 1, 1918. No. 2,097.

ELECTRICAL REVIEW.

Vol. LXXXII.] CONTENTS: February 1, 1918. [No. 2,097.

	Page
The World that is to be	97
German Influence in the Swiss Electrical Industry	99
Resistances for Starters and Controllers, by "X"	100
Electroculture at Chester (*illus.*)	101
Correspondence—	
Chief Engineers and their Remuneration	101
Conversion of a Continuous System to Three-phase	102
Communication with Aircraft	102
Faults	102
New Electrical Devices, Fittings and Plant (*illus.*)	103
The Faraday Society	104
Problems of Industry	105
War Items	106
Legal	106
Business Notes	107
Notes	109
City Notes	113
Stocks and Shares	115
Market Quotations	116
Exports and Imports of Electrical Goods during October, November and December, 1917	117
Notes on Welding Systems, by Capt. J. Caldwell (*concluded*)	117
Electric Cooking as applied to Large Kitchens	118
Reviews	119
New Patents Applied for, 1917	120
Abstracts of Published Specifications	120
Contractors' Column	Advertisement page xxii

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C. 4.

Telegraphic Address: "AGEKAY, LONDON." Code, A B C.

Telephone Nos: City 977; Central 4425 (Editorial only).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

Subscription Rates.—Per annum, postage inclusive, in Great Britain, £1 1s. 6d.; Canada, £1 2s. 10d. ($5.80). To all other countries, £1 10s.

FOREIGN AGENTS:

ADELAIDE: Messrs. Atkinson & Co., Gresham Street.

AUCKLAND N.Z.: Gordon & Gotch, Albert Street; The Mining and Engineering Review, 31A, Strand Arcade, Queen Street.

BRISBANE: Gordon & Gotch, Queen St.

CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.

DUNEDIN, N.Z.: Gordon & Gotch, Princes Street.

JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c.: Central News Agency, Ltd.

LAUNCESTON: Gordon & Gotch, Cimitiere Street.

MELBOURNE: The Mining & Engineering Review, 20, William Street; Gordon & Gotch, Queen Street.

MILAN: Fratelli Treves.

NEW YORK: D. Van Nostrand, 25, Park Place.

PARIS: Boyveau & Chevillet, 22, Rue de la Banque.

PERTH, W.A.: Gordon & Gotch, William Street.

ROME: Loescher & Co., Corso Umberto 1° 307.

SYDNEY: The Mining & Engineering Review, 273, George Street; Gordon and Gotch, Pitt Street.

TORONTO, ONT.: Wm. Dawson & Sons, Ltd., Manning Chambers; Gordon and Gotch, 132, Bay Street.

WELLINGTON, N.Z.: Gordon & Gotch, Cuba Street.

Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, and crossed "London City and Midland Bank, Newgate Street Branch."

THE WORLD THAT IS TO BE.

IN discussing some of the problems connected with the vast work of reconstruction a few weeks ago we expressed the opinion that the Department presided over by Dr. Addison must inevitably become the greatest of all Government Departments. Closer acquaintance with its manifold operations, which the Minister of Reconstruction has again privileged the Press to make, confirms and strengthens us in that opinion. Our fear is that the necessity for continuing our military, naval, aerial, and munition-manufacturing efforts makes so imperative a demand upon the efforts of most of us that the truly fascinating story of reconstruction investigations and plans cannot be read by the millions as it deserves to be. Dr. Addison may be able to educate thousands of hearers at the meetings that he is addressing in different parts of the country, but he is handicapped, in our opinion, by the inability of the Press to give that detailed publicity to his utterances that future, and perhaps immediate, national necessities demand. We would say frankly that we believe it to be one of the most urgent needs of the moment that the Cabinet should see that the Press which is responsible for the education of the people should be freed to the utmost limit of Governmental power from restrictions of labour and of paper supplies. Dr. Addison may educate his thousands, but the serious Press, through its thousands of voices, may educate the masses if only its working conditions can accommodate themselves to full and free publication of all that reconstruction means, the foresight with which its problems are being investigated, and the thoroughness with which its plans are being made. It is deplorable that this light has to be hid under a bushel, for knowledge of the measures that are in prospect would, we believe, go far to allay certain nervousness in regard to the future, and to fill with hope and confidence those who are wondering however it can be possible for affairs to be brought back to anything like normal conditions without a crash.

The work of reconstruction is, of course, an undertaking of most exceptional complexity. It must touch at some point or other every department of public and private activity—all classes, all industries, all trades, all professions. Since August last the Chief Designer and his associates have been designing the whole as one grand mosaic, and bit by bit the parts have been fitted in until, in theory at any rate, it is possible to see what must, or should, be done in order to facilitate the orderly return of men and industries, food and materials, finance and shipping, and so forth, from the chaos and confusion of war to the constructive operations of peaceful life. True it is that some parts of the great mosaic may yet be wanting, or that some parts will have to give place to others as experience is gained; also, there may be ground for wondering whether unexpected factors will intervene to jumble up the whole. But the theoretical design will stand a far better chance of being developed into one grand national effort to carry it into practical effect, with the hearty co-operation of all

parties, if the public confidence can be secured by the aid of maximum publicity. Naturally enough, during the last six months manifold sections of industrial life have been called into counsel concerning the future of their own particular interests, and to that extent it is becoming known what is to be expected, but we repeat that everything is to be gained by letting the public know in their millions the story of the whole. The speeches of a Hertling and of a Czernin are as we write of supreme importance, but the Press has its limitations, and if such speeches were by any change of good fortune to lead to more hopeful signs of an early end of the war, the people would know far less than they ought to know concerning what is to be expected to happen after the war. We do not forget that a certain Minister, not unknown for an aptitude for "butting in," once "butted in" with the brilliant advice that we should leave after-the-war to look after itself. We cannot afford to do that now, as those who know the manifold, the almost overwhelming, problems that are commanding Dr. Addison's attention are fully aware. Many of those problems may be destined to come shortly before legislative assemblies in the form of concrete proposals, for there is a legal section which is examining all propositions with a view to determining what amendments of the existing law are involved. It will be a pity if a whole host of legislative proposals has to be brought forward for adoption in a hurry unless the public mind has been prepared for them.

As space permits we shall refer to the work of the Reconstruction Ministry, but for the present we must be content with little more than a general outline of the four main departments. This alone will serve to indicate the vastness of the area to be covered. Class "A," which will deal with commerce and production, of course includes the supply and control of raw materials after the war. We have done our best to acquaint the industries with which we are concerned with the need that exists for them to connect themselves up into the form of organised trade associations if they desire to secure a fair and equitable apportionment of such materials as are available after the war for urgent industries which have a reasonable claim to priority of treatment. The same Class is dealing with the important question of financial facilities for British commerce and industry; with the preservation of industries which play an essential part in reconstruction, but are in danger of extinction through failure of supplies of material or labour; with the establishment of new industries after the war; with the volume and nature of the demand for British goods after the war; and with the improvements in trade organisation for the purposes of more economical production, distribution, and marketing, and of facilitating and expediting the turn over from war to peace. Here alone we have questions enough almost to bewilder the industrial mind. The situation with which this Class is faced is described thus: After the war there will be a world shortage of certain materials, and the shortage will be accentuated by the difficulty of finding tonnage adequate to our demands; on the other hand, there will be an almost unlimited demand for manufactured goods. By estimate and analysis, we shall get to know the available supplies of ourselves and of our Allies, and shall determine also the demand, the nature of it, and the priority order which must be imposed in regard to materials, labour, power, tonnage, and credit, for the good of all. We shall want to re-establish industry with the utmost expedition, avoiding causes for undue distress as far as possible in any department, and the Government policy will be to leave industries to ration themselves. Can this be done as readily where isolated units have to be dealt with, or by negotiating through large associated committees formed from representative trade associations and bodies connected with particular industries? There is only one answer, and the individual duty is therefore plain.

The second leading Class, "B," will cover matters affecting finance (currency and exchange), shipping, and common services, and will include the disposal of vast Government stores. Class "C" will cover the immense problems of labour and industrial organisation. Here we touch such matters as the relations of employer and employed, and the Whitley Report comes under attention as the one outstanding constructive proposal to that end. But, as we have said already, what do the mass of workers know about the Whitley Report at present? A professional man the other day, busy with all sorts of pressing activities, asked us in the most childlike and bland manner: "What is the Whitley Report? I have never heard of it!" A speaker going to a working-class district to hold forth on the problems of industry and the breaking down of class enmities, was advised, "You had better assume that the audience knows nothing about the Whitley Report!" May we again repeat how sadly we are at a loss for want of full and free publicity concerning matters of such vital importance? Dr. Addison must not be surprised if such proposals are not widely acted upon if the public have never properly understood them or been impressed with their urgency. The Whitley Report stands for a great principle, and each industry must consider for itself how far and in what manner it can be applied. We seem to be in need of a "Peace Aims" Committee as well as a "War Aims" Committee, and matters should not be left for promulgation by one voice crying in the wilderness about the paths that need to be made straight for the coming of national salvation. Class C will also in some measure concern itself with demobilisation. We will only touch one point now to show where its activities may be very beneficial. The return of "pivotal" men in advance of the mass of workers will prepare the way for the latter to start work immediately after the promised Peace holiday. The selection of the right men will rest with associations who will be able to evaluate the services of individual men to a particular business or firm. This is an excellent point, and we believe is a tribute to the foresight which the Reconstruction Department is displaying—in theory, of course, at present. We trust that it will be found to work out according to design, for much may depend upon it when the nation is rocking on the waves of uncertainty and change. There are other Classes which will bring foresight, ingenuity, and legislation to bear upon questions relating to rural development, the machinery of Government Departments, health and education, housing, and internal transport (roads, canals, &c.), but these we can only thus crudely indicate just now.

What may emerge from all that is happening among the statesmen and peoples of enemy countries who can say? In the midst of war we must be preparing for peace. Dr. Addison, we believe, will merit the gratitude of millions if the schemes of which he is the father can be carried through in such a way as to enable us to bring peace, prosperity, and happiness in the nation when the battle-drums cease to beat in Flanders, but he can only prepare the way for those eagerly awaited times by an intelligent understanding and acceptance of his proposals on the part of the people. The Prime Minister, with his great qualities of imagination and vision, and his capacity for leading Democracy, assuredly sees that quite well. No doubt when he observes the right signs on the horizon he will speak words that will transform for the multitude the manifold details of Dr. Addison's unobtrusive operations, and will lead the people to hopeful contemplation and co-operation in ways which may save the situation in the early days of Peace, just as he helped to save the Allied cause for us all at critical stages of the War.

GERMAN INFLUENCE IN THE SWISS ELECTRICAL INDUSTRY.

It is scarcely surprising to learn, in view of the geographical proximity of Germany and Switzerland, that the question of the former's influence on the latter's industries has been brought forward for discussion, on the general principle that the war has evoked a desire in every country to transform all industries, where possible and deemed necessary, into undertakings of a strictly national character in those cases where foreign interests are also concerned. In Switzerland certain daily newspapers during the past 12 months have published what are termed more or less sensational articles referring to German penetration, particularly in the Swiss electrical industry. The Comité de l'Union des Centrales Suisses d'Electricité recently had occasion to reply to one of these articles which was couched in general terms, and contained, it is stated, false assertions concerning Swiss works, and now the Comité of the Association des Electriciens Suisses has taken the matter in hand as a result of the publication of further articles, repeating the same statements, and mentioning names. With this object in view the Comité requested M. E. Tissot, administrateur-délégué of the Banque Suisse des Chemins de Fer, of Basle, who is a competent engineer well known also in French technical and industrial circles, to clear up the situation by means of an article, which is printed in the Association's *Bulletin* No. 12.

The author divides his article into three parts, the first dealing with supply works, the second with electro-metallurgical works, and the third with manufacturing works. The companies mentioned in the first class are those of Olten-Aarburg, with its Olten-Goesgen works, the Beznau-Löntsch, the Rheinfelden, and the Lauffenburg Companies. It is explained that practically all the capital of the Olten-Aarburg Co. is in Swiss ownership, that the Beznau-Löntsch undertaking has become the property of the State (the North-Eastern Swiss Cantons), that the Rheinfelden Co. is domiciled in, and controlled by, Germany, and one works is situated on German territory, whilst the second works (Wyhlen, in Baden) has a barrage in common with the Swiss Augst works; and that about 60 per cent. of the capital is held by Germans, who had a majority on the board of directors at the end of 1916. As to the supply of energy from these works to other countries, it is mentioned that, according to the table of power exported from Switzerland at the end of October, 1917, the deliveries to Italy and France represented 71,806 H.P., and those to Germany 53,617 H.P. It is explained in this connection that agreements under which the concessions were granted authorised the exportation of energy, that the export authorisations are only for a relatively short period, and that some works would not have been brought into existence if the owners had not been guaranteed beforehand a considerable revenue by means of contracts entered into with foreign distribution companies.

Coming to consider the second group of works, the author first refers to the Neuhausen Aluminium Industry Co., the majority of whose share capital is stated to have been already held by Swiss investors prior to the war, whilst in the meantime further shares held by Germans have been returned to Switzerland. It is estimated that the maximum amount of the share capital held by Germans was one-third of the total capital at the end of 1915, and almost all the loan debt has been raised in Switzerland. Notwithstanding this state of affairs, the German members of the board of directors numbered nine in 1908 as compared with three Swiss, and six in 1914 as against the same number of Swiss, but in 1916 the Teutonic element declined to five, as contrasted with nine Swiss. It has to be noted, too, that although the company does not belong to any special financial group, German finance is represented in it by the Deutsche Bank and the Berlin Handels Gesellschaft, whilst the A.E.G. has played an important part in the foundation and development of the undertaking. In this connection some interesting figures are given respecting the total exports of aluminium from Switzerland. The Neuhausen Co. practically has a monopoly of the production, as the output of the Giulini Co., at Martigny, is insignificant, and consequently the exports almost entirely emanate from the former. It is shown that the value of the exports to Germany, which only amounted to £476,000 in 1914, increased to £1,395,000 in 1915, and further to £1,760,000 in 1916. On the other hand, the exports to France were of the value of £10,000, £39,000, and £81,000, and to Italy £13,000, £7,000, and £56,000 in the same years respectively, whilst the exports to Great Britain were of still less importance.

The position of the Usines Electriques de la Lonza, of Basle and Gampel, is next referred to. Swiss capital and Swiss directors always having had the preponderance in the undertaking. It is considered that from 60 to 65 per cent. of the company's production of carbide of calcium and ferro-silicon is forwarded to Germany and Austria, although a portion also finds its way to France, and a still smaller quantity to Italy. The production of the Gothard Werke, A.G. fur Elektrochemische Industrie, of Bodio (Tessin), also comprises carbide and ferro-silicon, and as one-half of the share capital was subscribed by Germans, it is held not to be surprising that a large portion of the output reaches Germany. On the other hand, the works of the Carbures du Day, which are also situated at Bodio, are declared to be working solely for the Allied Powers, and the same remark also applies to several other electrochemical works in Romand Switzerland. If the horse-power exported from Switzerland is added to the horse-power utilised in the manufacture of electrochemical products for export, it is shown that the power placed at the disposal of the Central European countries amounts to 164,000 H.P., as contrasted with 114,500 H.P. in the case of the Allied countries, and the latter total will soon be increased by 3,750 H.P. by the bringing into operation of a new works in the Tessin, and by a further 20,000 H.P. at no distant date by the starting of works on the Franco-Swiss Rhône.

The author finally proceeds to refer, somewhat briefly by comparison with his statements concerning the supply and electrochemical works, to the manufacturing branch of the industry, and in this case he only mentions two firms: Brown, Boveri and Co., of Baden, and Escher, Wyss & Co., of Zurich. In the former case the combined share and loan capital totals £2,381,000, and the board of directors was composed of four Germans and nine Swiss in 1913, and three Germans and 10 Swiss in 1914, but the Germans do not appear for 1916 and 1917, the number of Swiss directors remaining at 10 in each year. It is stated that the A.E.G. felt the competition of Brown, Boveri & Co., and endeavoured at one time to obtain possession of the company by an interchange of shares and directors, but that the former found it impossible to convert the latter into a subsidiary, and only Walter Rathenau remained on the Baden board until 1914 as representative of the Zurich Bank for Electrical Undertakings, which was founded by the A.E.G. No mention was made in the annual report of Brown, Boveri & Co. for 1914 as to the cause of the resignation of W. Rathenau, but it is assumed to have been due to his accession to the board of the A.E.G., of which he became chairman on the death of his father. The total investments of Brown, Boveri and Co., probably for the most part in other countries, reached £1,044,000 in April, 1917, of which £600,000

is assumed to apply to Germany. It is considered certain, however, that German capital invested in the company, whose shares are quoted in Germany, is considerably less than this figure, especially having regard to the return of large parcels of shares formerly held in Germany, due to the favourable rate of exchange. The author, therefore, states that it is incorrect to speak of a German share (*rôle*) in this undertaking. It is known that the Baden works have never carried out war contracts, except for Switzerland, and a statement to this effect has been made in the company's annual reports, as previously mentioned in this journal. As contrasted with this position of affairs it would be surprising, it is stated, if the subsidiary companies and the undertakings in which the company is interested in Germany, Austria, France, and Italy had not worked for the national defence of the countries in which they are located.

The firm of Escher, Wyss & Co., which has a combined share and loan capital of £500,000, for a long time was under the influence of the A.E.G.-Lahmeyer group, who controlled the majority of the shares. This situation of affairs, however, has been entirely modified during the past 12 months, and out of 12 directors now only one is German, as compared with three in 1914. Although never having a majority on the board, the Germans played an important part in the company until 1916-17, when a group of Swiss banks and investors acquired almost all the shares then held by the A.E.G.-Lahmeyer group. Since that time the company has regained its independence. Apart from the fact that the author has refrained from mentioning any other Swiss manufacturing companies, it is rather unfortunate that he has thrown no light on the position of the works at Ravensburg, Wurtemburg, for the firm of Escher, Wyss are styled as of Zurich and Ravensburg. We ourselves are in some doubt as to whether or not manufacturing at this German town was discontinued a few years ago. If, however, operations at Ravensburg were abandoned, it is a pity that the company still retains, or at all events still adhered to in 1916, the second name as a business address, under the conditions of the war.

RESISTANCES FOR STARTERS AND CONTROLLERS.

By "X."

There is little difficulty in building resistances with metallic elements which are mechanically and electrically sound when the currents to be carried exceed 100 amperes on continuous rating, or 200/300 amperes on a two-minute rating, because the cross-section of the material is sufficient to give the required strength and rigidity even when a comparatively brittle metal is used. The difficulty becomes serious with currents of 50 amperes continuous rating and 100 amperes two-minute rating, and is acute with currents of 10/20 amperes and under. It may be mitigated at the higher limits by making the sections far too heavy for the current, but at the lower limits this waste of material is too great to be contemplated with equanimity.

Non-metallic resistance units, consisting solely of carbon in various forms or carbon mixed with sand or similar materials, have been tried from time to time, and have obtained a certain vogue, but they have never come into general use owing to the defects germane to the type.

Metallic resistances may be taken to hold the field for all practical purposes, and it is useful to review the methods which are in daily use to lessen their inherent imperfections and obtain the desired unbreakableness.

The term "unbreakable," so frequently used when specifying resistances, is rather misleading in this connection, because a resistance which is breakable, in the sense that it may be smashed with a hammer, may give far better results when suitably protected than one made of the toughest materials, but imperfect in other respects.

What is desired is an element which, on balance, possesses the fewest defects. The usual materials are cast-iron in the form of grids, sheet-iron, steel, or alloy as stampings, and wire of iron or alloy. A resistance made of wire offers many advantages over cast-iron or stamped grids.

Cast grids, unless made of malleable iron, are brittle; they cannot be made of small sections, and it is necessary to support the smallest section made in some special manner to prevent breakage in transit. The increase of resistance with temperature is considerable, and is prohibitive when anything approaching uniform resistance values is required; the variation of resistance between the grids due to slightly different mixtures is apt to be appreciable.

Stamped grids are an improvement, because they can be made of steel or an alloy with a small temperature coefficient, and the cross sections can be smaller than with cast-iron; but very small sections are either impossible or inadvisable, and grids of the smaller sections have to be very liberally supported to prevent buckling.

Wire resistances, being drawn, are tenacious, and there are sufficient sections manufactured to permit a close approximation to the most economical area for any required current-carrying capacity. The resistance may be adjusted exactly to the desired value, whereas it must, in practice, always be an approximation with grids.

Wires made of alloys with good lasting properties, very low temperature coefficient, and very little variation between one consignment and another are easily obtainable. The only difficulty consists in supporting and insulating the wire in a satisfactory manner without obstructing the free passage of air necessary to limit the temperature rise to a reasonable value.

The old-fashioned wire spiral was excellent as regards ventilation, but short-circuits from spiral to spiral, and from turn to turn, were frequent, especially on overloads. Many attempts have been made to produce something more substantial, yet well ventilated, with varying success. A form suitable for a large range of sections down to the smallest is the wholly, or partially embedded, and there are many variants of this type, such as enamelled metal plates with the wire in the enamel, wire wound on enamelled metal tubes, wire embedded in cements and supported in diverse ways, but they all suffer from the defect that to a greater or less extent the process is special, necessitating special tools or special mixtures, special methods of allowing for the expansion of the wire, either in the mixture or in the support, and adjustment or repair on site is difficult, if not impossible.

Another form suitable for small wires is a mat, or net of insulating fireproof material with the wire woven in the net. This method supports the wire adequately at first, but the material absorbs a great deal of moisture, and is liable to disintegrate on repeated heating and cooling, particularly when subject to vibration.

The material must be free from acid, to begin with, and must not be used when it can absorb acid from the atmosphere. Each mat has to be well supported and insulated if air is to circulate freely, and if the mats are assembled in a block for greater mechanical strength, the cooling surface is reduced to the minimum, and, in either case, it is not easy to tap off at the exact resistance value. A third form is made by crimping wire into large corrugations, and supporting each corrugated section on insulating material.

If the supports are numerous, the wire relatively thick, and the insulating material as fireproof as porcelain, this type is capable of good results, but it is difficult to avoid the use of a large number of small pieces of insulating material, and not easy to secure the wire adequately to the supports, or to support the terminals for the cables connected to the taps in a satisfactory manner. Repair and adjustment on site frequently necessitate considerable disturbance of the neighbouring units.

A fourth pattern is made by winding the wire in a spiral groove on a heavy earthenware cylinder, which is supported

by, and may be insulated from, a metal rod at the axis. This form is suitable for all sizes of wire; the grooves adequately prevent contact between turns, and support the wire throughout its length.

The cylinder may be glazed or made of china when it is necessary to expose the resistance to the weather; double insulation is provided by the cylinder and by the insulation between cylinder and rod, and triple insulation for very severe conditions may be obtained by insulating the rods from the supporting frame. The cylindrical section ensures plenty of air space between the elements, and the wire-wound cylinder successfully withstands rough handling far in excess of any it can possibly receive in practice when housed in its frame. The fire-resisting qualities are perfect, and the worst vibration cannot cause short-circuits.

Taps may be taken off at any part of the wire; the grooves, as a rule, support the terminal clips in a sufficiently rigid manner, and greater rigidity can be obtained by clamps on the cylinders. Repairs and adjustments on site are easily made with the minimum of disturbance to the resistance as a whole.

An oil-immersed resistance of this type leaves little to be desired.

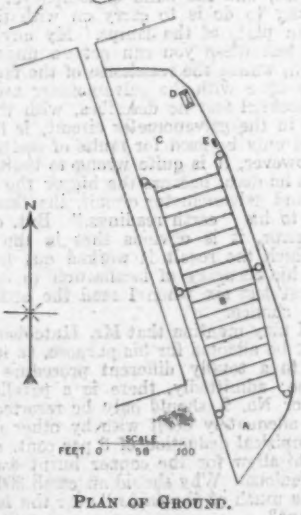
ELECTROCULTURE AT CHESTER.

WE have received the following report on the electrocultural experiments carried out for the Corporation by Mr. S. E. Britton, city electrical engineer, Chester. The land, comprising 1·4 acres of pasture, was ploughed and trenched shortly after Easter, and arranged in three plots of, approximately, A, 970 sq. yards; B, 4,000 sq. yards; C, 1,800 sq. yards; the largest plot was equipped for electroculture, and lies between the two smaller plots.

For comparison, three varieties of potatoes were planted, and the following result was obtained:—

	Great Scot.	King Edward.	Summit.
Plot A—Natural Control—			
No. of roots	413	315	359
Average yield per root	1·363 lb.	·485 lb.	1·344 lb.
Plot C—Natural Control—			
No. of roots	—	238	398
Average yield per root	—	·567 lb.	1·497 lb.
Plot B—Electroculture—			
No. of roots	2,294	480	7,294
Average yield per root	1·684 lb.	1·231 lb.	1·451 lb.
	23·5 % inc.	153 % inc. & 117 % inc.	7·5 % inc. 3·1 % dec.

With regard to the Summits grown on Plot C, it should be noted that the supply wire from the shed to the discharge wire was passed over this ground, at a height of 8 ft.

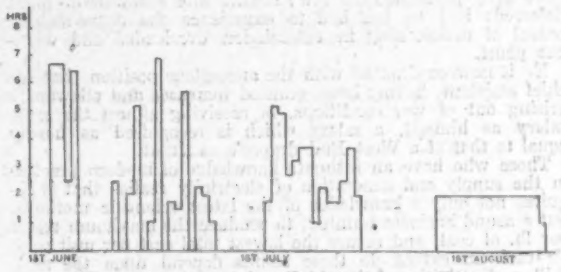


PLAN OF GROUND.

A, C, control plots; B, electroculture plot; D, hut; E, earth plate.

Other vegetables were grown, but, owing to late planting, no attempt was made to obtain comparative result. Peas, beans, white turnips, swedes, and beet did well; carrots and onions were very poor, both in quality and quantity. Greens did well, and it was noticeable that those under electroculture were not attacked by caterpillar to the same extent as those under natural control. No manure or fertiliser was used.

The electrical equipment consisted of a 10-in. coil, with mercury break-current interrupter and Lodge valves, housed in a wooden shed, 25 yards from the plot, and an earth plate close to the plot. No. 30 S.W.G. galvanised steel wires were used for the discharge, placed 15 ft. apart and hooked to $\frac{7}{16}$-in. S.W.G. span wire attached to insulators, and the whole supported by six poles. To each of the poles was fixed a wrought-iron bar, which enabled the discharge wire to be placed at any distance from the ground between 2 ft. 6 in. and 6 ft. 6 in. The apparatus was supplied with 5 amperes at 210 volts D.C., which would maintain a spark $\frac{3}{4}$ in. long, when an earth wire was placed that distance from any part of the discharge network.



HOURS DURING WHICH DISCHARGE WAS USED.

At the commencement the discharge wire was placed as near as possible to the ground, and, as the crop grew, raised to about 6 in. above the foliage. When climatic and other conditions allowed, the discharge was used from 6 a.m. to 8 a.m. and 6 p.m. to 8 p.m. daily, and during dull days between mid-day and 2 p.m. In all, the discharge was used for 122 hours, during which time 128 units were used, and the direction of the wind being from the south 16 per cent., south-east 23 per cent., south-west 42 per cent., and west 19 per cent.

This experiment indicates that it is not detrimental to place the discharge wire near to the plant, and that for experimental purposes and to obtain comparative results, it is not necessary to have the control plot several hundred yards distant from the plot under electrical treatment, as is the case when the discharge wire is placed 10 to 15 ft. above the crop.

Mr. Britton concludes that although the subject is a complex one, and at the present rate of progress it will take years to develop, the possibilities appear to be tremendous, and when it is better understood astounding results may be expected. It should, however, be made perfectly clear that its present state of development does not warrant its general application, and that there is yet to be evolved a more settled conception of the botanical effects and electrical requirements on which to base the practical work; therefore at the present time results should be treated as experimental. Probably the most useful progress would be made by encouraging electric supply undertakings in conjunction with plant physiologists to systematically experiment on small plots.

Early experiments demonstrated that the development of electroculture promised to produce results of vital importance, and having regard to what has been achieved in recent years it is astounding that the Government Departments concerned with these matters should be so inactive in utilising the suitable facilities which exist in many parts of the country for more speedy investigation of the problems associated with the use of electricity in producing increased crops.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Chief Engineers and their Remuneration.

I was greatly interested in reading your article affecting the award of Sir George Askwith in your issue of January 18th, pages 63 and 64, particularly your reference to chief engineers, especially as to "enriching themselves," "profiteering," &c.

I recall many articles in your valued journal dealing with the inadequate remuneration of chief engineers, considering their responsibilities and expensive training. Most of your readers will, I am certain, agree with me that such expressions referred to above, even when used in such an article as that referred to, are, to say the least of it, distinctly novel.

Years ago, long before war was even in sight, we were led to believe that the salaries of chief engineers would be revised in their favour, especially in undertakings municipally owned.

I do not intend to speculate upon or interfere in a matter which at the moment is *sub judice, i.e.*, if a war bonus is to be granted, or to what extent, but I would merely point out that the Government, whom you justly blame for the unrest

D

preceding this latest arbitration, have granted their officials a bonus of 10 per cent. whose salaries would come within that of the average chief engineer. What I want to emphasise, without regard to these bonus awards, is that the question of chief engineers' remuneration is much belated, a position not mitigated, but seriously aggravated, during the last three and a half years. During that period he has been forced to keep his undertaking going under exceptionally trying circumstances; his competent staff has dwindled through voluntary and compulsory enlistment; loans for repairs and extensions have been prohibited by law; repairs and renewals of plant deferred; and he has had to experience the nerve-racking ordeal of maintaining in commission overloaded and worn-out plant.

He is now confronted with the anomalous position that his chief assistant, having been granted increases and allowances arising out of war conditions, is receiving almost the same salary as himself, a salary which is recognised as hardly equal to that of a West End draper's assistant.

Those who have an intimate knowledge of modern practice in the supply and generation of electricity realise that it requires not only a knowledge of the latest scientific methods, but a sound business training, to produce the maximum result per lb. of coal, and secure the lowest total cost per unit sold. To such an extent do these results depend upon the zeal, skill, and activities of the chief engineer, that even if granted half as much again as his present salary, he could save it to his undertaking many times over in the 12 months.

It may be taken for granted that I hold no brief for this section of the industry, but in equity and fairness, and having regard to the overwhelming importance of the industry, which is foremost in national enterprise and development of kindred industries, then I feel that the proverb applies, "There is that withholdeth more than is meet, and it tendeth to poverty." If we are to develop our national resources as we hope to, and reap the collateral benefits which must accrue, then it follows as an elementary principle that we must attract the best men and the best brains, otherwise we can expect nothing but retrogression, a characteristic which in many respects is identified with our national temperament of *laissez faire*.

I make bold to say that there is neither rhyme nor reason why the whole position of salaries of chief engineers should not be considered forthwith, and dealt with on business lines, especially where the constant growth of undertakings under their control, and their corresponding responsibilities have progressed out of all proportion to their remuneration. Further than this I have nothing to say, except to leave it to the good sense of those responsible.

Duncan Watson.

London, W., *January 26th*, 1918.

[We are glad to see that Mr. Duncan Watson, chairman of committee of one of the most important Metropolitan municipal electrical undertakings, so fully appreciates the value of the services of chief electrical engineers; in this regard we are entirely at one with him, as our past record, to which he refers, amply demonstrates. Unfortunately he discusses the general case, to which the remarks which he criticises do not apply. We were careful to confine their scope to the case of engineers of *important* undertakings who were "already in receipt of salaries sufficient to meet their needs." Surely it is unnecessary to say that our comments, thus explicitly restricted, do not apply to those who do not fall within the limits thus defined; yet Mr. Watson discusses the case of a chief engineer in receipt of a salary "hardly equal to that of a West End draper's assistant"!

Not only did Sir George Askwith's award include the technical staff, but in an explanatory memorandum he said: "At least some of them whose status borders upon certain of the skilled men receiving the 12½ per cent. would be placed in an unfair position unless some consideration was given to them." The question how far this consideration should go, and which members of the staff it should include, was expressly stated to be a matter for the employers themselves to arrange, thus clearly indicating that he did not anticipate that it would go right up to the top in every case.

On reference to Mr. Faraday Proctor's memorandum, published on p. 85 of our last issue, it will be seen that attention is drawn to the course followed by large engineering firms which are paying the 12½ per cent. bonus to members of their staff receiving not more than £250 per annum, and bonuses from 12½ per cent. down to 10 per cent. on salaries up to £500 per annum. This appears to be a perfectly reasonable policy, to which no objection can be raised; and our remarks were not intended to apply to such cases, or to cases where in the ordinary course advances might legitimately be sought quite apart from the question of the 12½ per cent. award. That there are many chief engineers to whom increments of salary are undoubtedly due, and long overdue, cannot be questioned, and we sincerely hope that their merits will be recognised at no distant date.—EDS. ELEC. REV.]

Conversion of a Continuous System to Three-phase.

It would be interesting to have the opinions of correspondents on the best method of converting a continuous-current three-wire distribution system to three-phase supply, the pressure on the outers being, say, 460 volts. One cannot put the three-phase current on to the existing three conductors, as the mid-wire is naturally too small, and even if the conductors were of equal size, in practice it is necessary to run four wires for three-phase distribution. I believe the usual method in these cases is to take separate three-wire circuits from the L.T. transformers, balancing one street against another. It will be interesting to know from those who have experience how this works, and the best way to carry out the conversion.

Transformer.

Communication with Aircraft.

A paragraph under this heading appeared recently in the technical Press stating that a form of miniature searchlight operated by electricity and equipped with a telescope has been introduced recently by the French Army for signalling to aircraft. It may be of interest to your readers to know that this is not a very recent innovation, and, in fact, a similar apparatus was introduced by this company in October, 1915. The apparatus is known as the "Chapman Hand Signalling Lamp," and is fitted with a sighting tube and handle. A self-contained Morse key and dry battery are carried on a waistbelt and connected to the lamp by a flexible lead. The projector of the "Chapman" lamp is designed to give the maximum signalling range with a minimum angle of dispersion as viewed from a distant station.

The "Chapman" lamp is being successfully used for communication with moving objects, *e.g.*, between aircraft and earth, or vessels in or approaching harbour, where the need for secrecy precludes the use of non-directional masthead lights. The entire equipment is extremely portable and light, weighing 3½ lb. only.

Graham & Latham, Ltd.
LIONEL J. GRAHAM, *Director.*

London, S.W., *January 22nd*, 1918.

Faults.

Mr. Hutchison's article in your issue of January 18th bears out the view I have always advanced, that good results in localising faults can be obtained even with the simplest possible appliances, the use of which does not require special qualifications or a high degree of manipulative skill. But it is disconcerting to read in his prefatory note that "really practical information on the subject is not easily obtainable." The methods he describes have been in use in practice for over 20 years. Thousands of faults in electric light and power mains have been localised with their aid, and the experience of the people who have done this has been described by them in at least a score of articles, and three consecutive editions of a book on the subject.

The only new things in Mr. Hutchison's article are certain details as to the execution of the tests, which, unfortunately, are open to criticism. He imposes unnecessary limitations on the application of the loop test. The bank of ten 25-C.P. carbon lamps which, he says, is to decide whether a loop test is to be used or not, will (assuming the voltage to be 200) have a resistance of about 50 ohms when hot, and a much greater resistance when cold, so that they will not glow unless the fault has a very low resistance. When the megger sails over to zero, and his bank of lamps yet won't glow, the obvious thing to do is to carry on with the loop test, putting a fuse in place of the lamps. My advice is always to use the loop test when you can get an undamaged cable or core as return, unless the resistance of the fault is so high that it can't be done with the galvanometer available.

The fall of potential test he describes, with the fault (and its back E.M.F.) in the galvanometer circuit, is far less accurate, and should only be used for faults of really high resistance. Then, however, it is quite wrong to limit the current to .4 ampere, as he does, because the bigger the voltage drop over the fault and galvanometer circuit, the less will be the inaccuracy due to his "earth readings." But, even without this source of error, it is obvious that in the example he describes, in which the result is worked out from readings of 19 and 26.5, his accuracy of localisation to 0.16 per cent. (I *did* enjoy that last six when I read the article) was the merest possible chance.

Incidentally, I may mention that Mr. Hutchison's abbreviation F.P. cannot be adopted for his purpose, as it has already been allocated to a totally different procedure occasionally used in war-time; admittedly, there is a parallel, for F.P., whether No. 1 or No. 2, should only be resorted to when a fault cannot be adequately dealt with by other means.

Lastly, the empirical deduction of 3 per cent. of the calculated distance, to allow for the copper burnt away near the fault, is too ridiculous. Why should an earth 300 ft. off burn away 30 times as much of the cable "near the fault" as one only 10 ft. distant?

F. Charles Raphael.

B.E.F., France, *January 25th*, 1918.

[Lieut. Raphael's modesty forbids him to mention that he is the author of the standard work on this subject, viz., "Localisation of Faults in Electric Light and Power Mains."—EDS. ELEC. REV.]

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

Tramway Relay-Operated Contactor.

In an article in the *Commonwealth Engineer*, by Mr. Robertson, engineer and manager of the Melbourne, Brunswick & Coburg Tramways, a new type of radial truck car which is being introduced into service is described. The electrical equipment possesses some novel features. Two 55-h.p., 600-volt, box-frame, self-ventilating type motors are employed, and the control arrangement is such as to avoid interruption of current in the controller.

The main circuit is made by a relay-operated contactor under the car. In cutting off, the initial movement of the

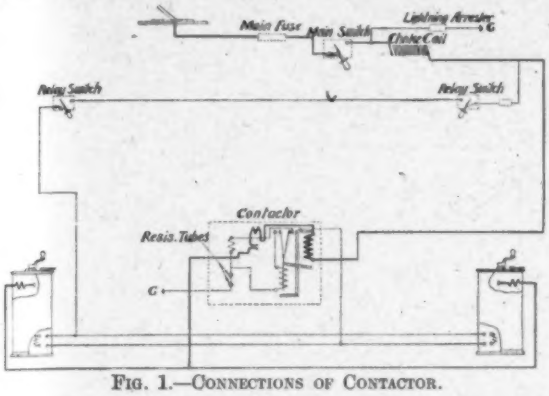


Fig. 1.—Connections of Contactor.

controller backwards, at any point, opens the contactor relay circuit, and the main current is interrupted by the contactor. It is hoped that this innovation will cut down controller maintenance to a minimum, and prevent any danger of fire on the motorman's platform. The contactor replaces the automatic feature of the canopy switches, so that there is only one of these which acts simply as a main switch, and not as a circuit breaker; in addition, there are two small relay switches, one at each end of the car. The arrangement is shown diagrammatically in fig. 1.

Automatic Electric Shell-Heating Furnaces.

The automatic electric furnace equipment for heat treating shells shown in fig. 2 is an adaptation of furnaces of similar size that have for years been used for the heat treatment of steel parts for railway and motor-car equipment. It consists essentially of two furnaces, the quenching mechanism, and the automatic control apparatus, by means of which all operations, or movements, of shells are accurately timed and executed.

The final control of the movements of the shells is centred in several contact-making pyrometers. They are so adjusted and calibrated that when the shells in the discharge part of the first furnace have reached their temperature and soaked for a predetermined time to ensure their being heated through, the special pyrometer controlling that furnace closes contacts, thus setting in motion, through a radial dial switch, the various motor control valves for pushing in a new row of shells, simultaneously discharging the fully heated shells, and allowing them to clear the furnace and drop into the quench. At the same time the pusher of the furnace is backed out and the doors are closed. Meanwhile, the shells that have

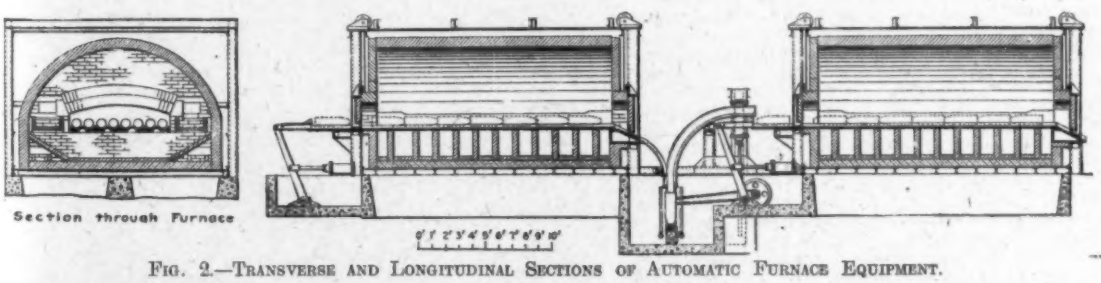


Fig. 2.—Transverse and Longitudinal Sections of Automatic Furnace Equipment.

just dropped into the quenching mechanism have commenced to rotate, and the spraying water is turned on and allowed to flow for a definite interval, which, in turn, is controlled by a motor-operated time element on the automatic control. At the end of this time-period the water is automatically shut off, and the shells just quenched are moved up by forks in each shell nose connected to the long radial arm. This arm delivers the entire row of shells in front of the pusher of the second furnace, and then returns to its position of rest at the bottom of the quenching mechanism, ready to receive the next lot of shells to be quenched. When the shells in the second, or drawing, furnace are fully heated to the required temperature, a similar operation takes place, wherein the shells that have just been received from the quenching mechanism are pushed into the second furnace, in turn pushing out the shells in the discharge end under the contact-making pyrometer tubes, which have by this time reached the temperature to actuate this equipment.

The illustrations show the size of an equipment used for heat-treating 45 8-in. American high-explosive shells per hour, which is equivalent to 3¼ tons per hour of any other size of shells, shrapnel or high-explosive.

The principal advantage of these electric furnace equipments over the ordinary types of furnace is greater precision and certainty in obtaining the required temperatures and quenching conditions. The human element is entirely eliminated, with the exception of placing the shells to be treated on the charging platform of the first furnace, subsequent operations being controlled by the automatic part of the equipment.

Other advantages are the great saving of labour, and reliability; it is a common thing for an equipment of this character to operate continuously for six or eight months at full capacity without an hour's delay.

These automatic furnaces are built by the Electric Furnace Co., Alliance, Ohio.—*American Machinist.*

A New Bulkhead Fitting.

As an instance of the scope that exists for the improvement of apparatus which has been for years accepted as standard, and as such not open to improvement, the Wilkinson patent

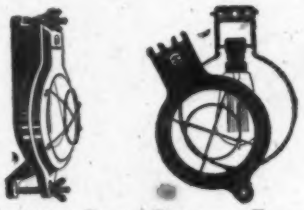


Fig. 3.—Wilkinson Patent Bulkhead Fitting, No. 610, Closed and Open.

bulkhead fitting is an interesting example. Since the days of the earliest carbon lamps one has been accustomed to the regulation bulkhead fitting, and no one seems to have thought it necessary to improve it. However, the great developments

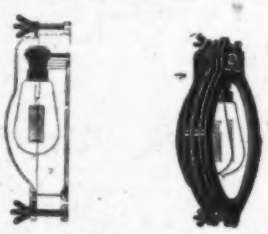


Fig. 4.—Fitting No. 614, for use Outside "Danger Buildings."

that have taken place in lamps and wiring methods have led to a complete re-design to put the bulkhead fitting into line with modern requirements.

The principal features claimed for the new design are facility of installation, easy wiring—looping-in in particular—centralisation of the filament, no hinges to corrode, easy removal of the lid without dropping it, and (in two of the types) the facility to use either one or two 40 or 60-watt lamps at will.

The holders (either one or two) are fixed by the shade ring in a plate sliding in the grooved sides of the case. The holders and plate can be removed for wiring, and the position of the plate varied to centralise the filament in the reflector. There are no small nipples. Ample space is allowed for slack wire.

The lid is removed by slackening the wing nuts, without

removing them. Two fixing screw holes only, both in the centre line, reduce wall plugging; fixing on a narrow pillar is simple.

The fittings are particularly suitable for ship use and chemical works. A special pattern, fig. 4, is made for use in, or rather, outside danger buildings, to project the light through the window, the door being at the back, so that the lamp may be renewed without disturbing the fitting itself.

The sole makers are the Wardle Engineering Co., Ltd., 196, Deansgate, Manchester, and 25, Victoria Street, London, S.W. 1.

A Lamp-Locking Device.

According to *The Electrical Trades Journal*, Mr. W. Stewart, of the Sydney City Council's meter staff, has patented and put on the market an ingenious keyless lamp lock. The act of turning the lamp causes the locking band to revolve, at the same time the locking pins ride round on the outside of the lampholder till they reach the slots, when they immediately snap into position, automatically preventing the lamp from being withdrawn. Before a burnt-out lamp can be removed it is necessary to break the glass. The locking spring can then be taken out, allowing the butt of the lamp to be withdrawn and a new lamp inserted as before. When a thief wishes to steal a lamp but finds he has to break it to get it, his object is defeated.

THE FARADAY SOCIETY.

The Setting of Cements and Plasters.

On January 14th the Faraday Society inaugurated the New Year's work with a general discussion on "The Setting of Cements and Plasters," to which the members of the Concrete Institute had also been invited.

Mr. James Swinburne, F.R.S., Past-President, made the interesting announcement from the chair that the discussion was intended to provide a survey of the present position of our knowledge of a very fascinating corner of applied physical chemistry, which it was hoped would be helpful in indicating the best lines of attack in an experimental research the Society intended to initiate after the war.

Dr. C. H. Desch, of Glasgow University, one of the few men outside America and France who have given attention to the chemistry of cements, was chosen by the Council to open the discussion, and in his paper the rival theories of setting at present held were clearly stated and judiciously examined. The simple case of the setting of plaster of Paris and similar cements would appear to be well understood. It arises from the formation on hydration of the compound $2\,Ca\,SO_4\,H_2O$ which is readily soluble in water, but from a super-saturated solution of which the dihydrate $Ca\,SO_4\,2\,H_2O$ crystallises out around any nuclei of that hydrate which may happen to be present in the mass, precipitating in radial crystals that interlock, and so produce a mass possessing considerable mechanical strength. Possibly a transformation of crystalline form also occurs—an hypothesis necessitated by the known expansion of plaster in setting. This "crystalline" theory was first put forward by Le Chatelier, who vigorously defended its application to cements as well as plasters in a paper contributed to the discussion. For it happens that even in plaster of Paris no crystals are visible under the microscope when first it sets, although in course of time obvious crystals certainly develop. This has suggested the "colloidal" theory of setting due to Michaelis.

Let us in the first place, however, consider our present knowledge of the constitution of Portland cement, as set out in the papers sent by Mr. A. A. Klein, late of the U.S.A. Bureau of Standards, and Mr. G. A. Rankin, of the Geophysical Laboratory, Washington, where a brilliant series of researches in these and cognate matters has for many years been carried out. The clinker from which Portland cement is made is a result of the chemical combinations brought about by burning at temperatures reaching to 1,650 deg. C. for the best brands, of a particular mixture of the oxides lime (CaO), alumina (Al_2O_3), and silica ($Si\,O_2$). Other component oxides, those of magnesia and iron, are of secondary importance. It has now been acceptably proved that the essential components of the resulting clinker are tricalcium silicate ($3CaO,\ SiO_2$), tricalcium aluminate ($3\,CaO,\ Al_2O_3$), and the so-called beta modification of calcium orthosilicate ($2CaO,\ SiO_2$). If the mixture is underburnt, free lime and other unessential constituents are also present.

The experimental study of the hydration of these separate constituents of Portland cement clinker has been carried out at the Washington Bureau of Standards. From this work it appears that the initial set in Portland cement is due to the hydration of the tricalcium aluminate, but the essence of the process—the reaction which gives to the cement its characteristic hardness and strength—is the hydration of the tricalcium silicate, which, making up 30 to 35 per cent. of a normal cement, is its most valuable constituent. Now what happens when water is added to tricalcium silicate is not the formation of a definite hydrated salt, but the separation of the lime and the silica, and the release of a gelatinous form of hydrated silica. In the complete cement this gelatinous silica forms round the individual grains and cements them together.

Such is the "colloidal" theory of setting in its most recent form, and it would appear to be directly opposed to Le Chatelier's conception of a mass of interlocking crystals. Dr. Desch attempted to harmonise the two views by means of Weimain's theory that the passage from the crystalline to the colloidal state is a continuous one, the latter simply being a condition in which surface forces are all-important. It is certainly a fact that in cement, as in plaster, crystals visible under the microscope appear in course of time, but this fact may be used to support either view. The analogy with ammonium nitrate, copper sulphate, and other crystalline salts having a tendency to set into a solid mass under certain conditions, which was pointed out by Dr. J. M. Lowry and Mr. F. C. Hemmings, does not necessarily apply to every case of setting. Dr. W. Rosenhain, in a very suggestive contribution to the discussion, wished to generalise the phenomena by including the "setting" of metals which was caused by crystal-adhesion due to the presence of a film of undercooled amorphous material between the crystals. We are not convinced that the matter at issue is one of words only, as Dr. Desch thinks, and for the time being the problem must be considered to be unsolved—with, perhaps, a bias on the side of the "colloidal" advocates.

Further investigations are obviously called for, and these will doubtless yield results of practical as well as theoretical value. In the meantime, an ever-present problem for the engineer, the builder, and the architect is how to improve the setting qualities of his cement. If tricalcium silicate is the most valuable constituent, why not increase the percentage of that compound? The answer is that too high a burning temperature would be required, and economic considerations at present stand in the way. But it may be possible to find some fresh constituent—call it a catalyst, if you like—in the presence of which gelatinous silica will be readily released from dicalcium silicate, as well as from the tricalcium salt, and this line of research, indicated by Mr. Rankin, is one that will no doubt emerge as a result of the discussion.

Several interesting papers of a more immediate practical character were also contributed. Mr. W. J. Dibdin, speaking on "Ancient and Modern Mortars," showed that, although many old mortars were of exceptional strength, it was only the modern rush for economy, by reducing the quantity of lime, that was responsible for the falling-off in quality. On the theoretical side, his examinations proved that soluble silicates were not formed in course of time, and, as to the setting of mortar, he agreed with Graham's view that it was due to the formation of a solid hydrate like gypsum.

Mr. Deny and Mr. E. H. Lewis described the effect on the setting properties of Portland cement of adding suitable slags, and they showed that using also limestone, and properly granulating the slag, excellent results could be obtained. The matter is obviously one for both blast-furnace owners and cement makers seriously to consider. Mr. Percy C. H. West reviewed the history of this subject, which in Germany has been the occasion of a good deal of controversy. Mr. Bertram Blount's careful contribution spoke on modes of determining the setting of cement and concrete—another aspect of the subject calling for investigation and standardisation—and finally the architect's point of view was admirably stated by Mr. W. D. Calve, who has been concerned with the question of the stability of St. Paul's Cathedral, and who gave practical illustrations of the value of a scientific treatment of problems connected with cement and concrete. Mr. A. Binns similarly voiced the standpoint of the constructional engineer, and he and Mr. W. J. Cooper laid down the proper conditions under which setting should take place in practice.

The discussion as a whole was both informative, stimulating, and suggestive, and the bringing together of manufacturer, engineer, architect, and chemist to talk over matters of common interest was in itself an end that justified the organisation of the meeting.

The Electrolytic Pickling of Steel.—Experiments were carried out by Messrs. M. de Kay Thompson and F. W. Dodson, at the Massachusetts Institute of Technology recently, on black sheet-iron, samples of which were pickled in hot acid 4·5 per cent. by weight, and by electrolysis in sulphuric acid of specific gravity 1·19 with lead anodes. The electrolytic process left the surface silvery white and very clean: the chemical process left it not so clean, but covered with fine black particles, which could be removed by rubbing and washing. The current density employed was from 0·033 to 0·058 amp. per cm.^{2} and the pressure 2·68 to 2·90 volts. The temperature of the solution was 60° C., and the time occupied was 2 to 5½ minutes. In the chemical process the temperature of the bath was about 100° C., and the time 3 to 8 minutes. The amount of iron dissolved was 0·0032 gm. per cm.^{2} by electrolysis, and 0·00386 gm. per cm.^{2} by chemical pickling; in the former case the scale was not lost but was reduced, whereas in the latter case the scale fell off and was lost. Besides the small economy of iron and acid resulting from the electrolytic process, the surface obtained was much better, and the acid was at a lower temperature and therefore less injurious to the workmen.

PROBLEMS OF INDUSTRY.

If it be true that in the multitude of counsellors there is wisdom, then we ought to be well prepared, in theory, at any rate, for the vast problems of labour and industry that inevitably arise from the revolution that has been working its way in our midst during the last three and a-half years. The guillotine has not been erected in public places, nor have rivers of blood flowed down our thoroughfares; but the guillotine has, nevertheless, been ruthlessly at work in the minds of men, lopping off old ideas, and along the byways to oblivion there has been flowing a stream of obstinately-held prejudices that were nursed in former times. If we are wise, we shall be content to have it so, for, platitude though it be, "things never will be the same again" in industry or, indeed, in much else. We cautiously say "much" else, because if there is one thing that is less altered than any other, it is that old Adam that is within us all, employed and employer alike. 'Twere blindness only that could fail to see that the old jealousy for individual self-interest in industrial life remains as deeply entrenched as ever in our nature. Perhaps the acute necessities of war-time have established it there more strongly than before; but, whatever the cause, there it is, and there it is likely to remain until hardships are removed or we are more potently influenced by higher ideals. There is little reason to anticipate an early removal of hardships—the simplest soul should be able to see that; but what of the influence of higher ideals in shaping the relationships of the coming days in industry? Since the publication of an earlier series of articles*, we have read much literature upon the industrial world that is to be. Experts are as numerous as the sands of the shore, who are able to tell of this, that, and the other measure that will provide a panacea for all the evils that will accrue from the war either as the direct results of industrial change or from the revolution that has been working, sometimes silently, sometimes otherwise, in our thinking. Some speakers of note have confined themselves to generalities, such as the need for better relations on "both sides," the employé to abandon his obstructive limitation practices in exchange for better wages, better housing, shorter hours, and generally improved conditions of life. Others have held that if we can only assure abundance of trade and plenty of employment, things may be relied upon to find their level again in the course of time. Others have planned special organisations which they would fain apply to industry, as though it were starting *de novo*. The Government has recommended Industrial Councils on the Whitley principles. And so on. But there are yet others who think that, in addition to a better understanding between Capital and Labour, the abandonment of old reprehensible practices, the cultivation of enormous volumes of trade, the elaboration of great organisations, and the setting up of Whitley Councils to secure the aforesaid better understanding in perpetuity, we have a pressing need for high ideals on "both sides," calling for a crucifixion of that old Adam to which we have referred already.

There never has been any shortage of cranks or faddists, or idealists, in this country, or in Europe generally, in modern times. Any departure from established lines of thought would readily bring such an appellation from the lips of the severely practical man, but we cannot with reason apply such terms in days like these, when the industrial atmosphere has undergone so remarkable a change, when new measures and new ideas are needed for new times and new conditions. Old conceptions can hardly be consigned to the scrap heap without new ones taking their place. Therefore, it is incumbent upon us to give a patient and generous hearing to those who dare to cut new ground and express themselves with originality and foresight concerning ways and means for securing a safe future for the nation and its industries. The idealists of one age have sometimes proved to the next generation that they were saner guides than the experts who contemptuously put their views aside. Yet we must make this reservation here, that time presses and we cannot afford to waste it upon mere dreams, if we are going to make ready early for the industrial situation that after-war upheavals will almost inevitably promote. The fact remains, however, that no superficial ready-made remedy is likely to be sufficient to the new situation. It may be found in the Whitley principle which involves so much in the matter of efficient organisation of trades preliminary to conference on points of disagreement; it may lie in increased efficiency and bigger productivity; it may lie partly in business organisation; it may be that parts of the recently issued Labour programme will furnish the way to peace and prosperity for all. But we need to go even further than all of these—deep down to fundamentals. Sometimes fundamentals and idealistic theories become confused, and it is, therefore, essential that we face such problems as confront us to-day with great care and discrimination.

We have before us a copy of the Watt Anniversary Lecture delivered by Mr. W. L. Hichens* at Greenock last month. Now, if we had not known that Mr. Hichens was a leader in an important industry, and therefore constantly up against the hard facts of practical industrial life as the chairman of Messrs. Cammell, Laird & Co., Ltd., we might have imagined, from parts of the discourse, that he was an idealist pure and simple, anxious to turn work into one long well-paid summer holiday, or was looking out upon industry as some clergymen do from the pulpit, quite oblivious of its nature and its difficulties.

But taking the address as a whole, we say convincedly that there is nothing impractical or idealistic about what he says, for there are clear evidences in almost every page that show that he is fully in touch with the movements of the hour, and is as alive to the actual emergent realities as any coldly calculating business organiser. When we find, therefore, that in considering the problems of modern industry he gets right down to the bases of human society—"Love of God and love of man"—as the final motives of all right conduct we find ourselves in full accord, and welcome this recognition of a matter far too often ignored in our controversies concerning industrial questions, and far too frequently lost sight of in discussing educational questions, as "Radix" pointed out in his recent serial in our pages. Without the bases referred to, says Mr. Hichens, "all societies crumble, and the world becomes the pandemonium that it is to-day." If we are a Christian nation, we should apply the principles of the religion that that name implies in our respective positions of employers and employed. The worker should not render shortened service, or the shopkeeper short weight, nor should the employer strive hard in order that he may pay no more than he is "compelled," or the purchaser pass bad coin or fail to pay his debts. These may be considered idle moralisings, but they are typical of what we believe Mr. Hichens has in mind, and we believe that if such principles were more generally adopted on "both sides," we should more readily find the way to industrial harmony, security, and prosperity than we shall do by some other means. The author sees no reason for discarding ideals in the practical affairs in life. "No sensible man would suggest, moreover, that all opportunity for individual profit should be taken away by legislation. To destroy the existing incentive without putting something in its place is merely to leave the chamber of men's minds a prey to seven devils worse than the first. Legislation cannot make belief; these must be determined by each individual conscience for itself, and legislation can only express what the public conscience has already accepted." Mr. Hichens sees that industry should be really recognised as primarily a national service in which each individual is fulfilling his function to the best of his ability for the sake of the community in which private gain is subordinated to public good. "If each man thinks of making his pile by all the means that economic individualism allows, if class bands itself against class, Trade Union against employers' federation, firm against firm, to secure the greatest share of the world's goods in unrestricted competition, social life must inevitably break down, and anarchy reign supreme." It is in order that we may avoid that breakdown and anarchy, when we have finished with the war, that Whitley Councils and organised association movements are designed, but they will neither of them succeed to the full unless they have some of the spirit of the higher idealism running through them.

(To be continued.)

* "Labour and Industry." Elec. Rev., May and June, 1916.

* "Some Problems of Modern Industry." Greenock Philosophical Society, January 18th, 1918.

WAR ITEMS.

One-Man Businesses.—In pursuance of its intention to encourage co-operation so as to safeguard the interests of owners of one-man businesses who are called to the Colours, the Director of National Service has appointed several well-known men to assist his Department in the matter. Among these is Mr. J. G. Wilson, Secretary of the National Federation of One-Man Business Associations, who is appointed a Temporary Officer of the Ministry.

Schedule of Protected Occupations.—The revised Schedule of Protected Occupations will come into force on February 1st. It renders available for recruitment all men medically classified fit for general service (Grade I), who had not attained the age of 23 by January 1st, 1917, whatever their occupation or the work upon which they are engaged, with the exception of certain classes of men engaged on hull construction and repair. A higher age has been fixed in certain occupations below which Grade I men will be recruited. Men of military age engaged on Admiralty, War Office, or munitions work, or in a railway workshop, whose occupation is not scheduled, are not entitled to protection on occupational grounds if they are medically classified Grade I.

Westinghouse War Fund.—We have received a copy of the statement of receipts and payments to the British Westinghouse Employés' War Relief Fund from August 22nd, 1914, to December 31st, 1917. The total contributions to the fund during that period have been £50,008, £33,417 from the employés and £16,591 from the company. The out-payments have amounted to £31,740 paid to dependents, while £12,031 has been set aside for a Disablement and Dependents' Fund, and £2,479 has been spent in donations to local and national funds and Christmas gifts. The number of British Westinghouse employés who have joined the Forces is 3,100, and we regret to learn that the casualties have been exceedingly high. The number of families in receipt of weekly relief is 757.

New War Committees.—We welcome the announcement that the Minister of Reconstruction has appointed the following committee of manufacturers and business men to consider the provision of new industries for the engineering trades:—

Hon. H. D. McLaren, M.P., C.B.E. (chairman).
Mr. Charles Bennion (British United Shoe Machinery Co.).
Sir George Bullough, Bt. (Howard & Bullough).
Mr. F. H. Crittall (Crittall Manufacturing Co.).
Mr. R. Dumas (British Thomson-Houston Co.).
Mr. W. B. Lang (John Lang & Sons).
Mr. C. A. Lister (R. A. Lister & Co.).
Mr. P. J. Pybus (Phœnix Dynamo Manufacturing Co.).
Mr. G. H. Sankey (Joseph Sankey & Sons, Ltd.).
Mr. Percy Stothert, K.B.E. (Stothert & Pitt).
Mr. J. Taylor (Mather & Platt).
Mr. W. Taylor (Taylor, Taylor & Hobson).
Mr. W. Thom (Yates & Thom).
Sir W. Rowan Thomson, K.B.E. (David Rowan & Co.).

The duties of the new Committee will be to compile a list of the articles suitable for manufacture by British engineers which were either not made in the United Kingdom or were made in insufficient quantities, and for which there is likely to be a demand after the war. The list is to be classified in three groups: Articles that can be made (1) by women, (2) by men and women, (3) by skilled men, and is to show the industries to which such new manufactures could most suitably be attached. According to the *Daily Telegraph* the Committee is also to make recommendations as to the establishment and development of these new industries by the transfer of labour or machines or by other measures; also, as to how such transfer could best be made, and what organisation would be needed for the purpose, with due regard to securing the co-operation of labour. To give help on this side of the work, a Labour Advisory Panel is being formed, consisting of representatives of skilled, semi-skilled, and unskilled workers, and of women. With this panel the Committee will work in co-operation on questions concerning labour.

The War Priorities Committee appointed some time ago by the War Cabinet to decide questions of priority of manufacture in their bearing on the conduct of the war, is composed of the following:—Lieut.-Gen. Smuts (Chairman), the First Lord of the Admiralty, the Secretary of State for War, the Minister of Munitions, the Minister of National Service, the Air Minister.

In order that the requirements of the public services, such as transport, light, heat, power, &c., may receive proper consideration, a General Services Committee has been appointed by the War Priorities Committee, under the chairmanship of Mr. John Wormald, M.Inst.C.E., with representatives from the Ministry of Munitions, Admiralty, War Office, Board of Trade, and Local Government Board. This committee considers the requirements of these services, and formulates on their behalf demands which are taken into account by the War Priorities Committee in their allocation of the available supplies of the various commodities. The chairman of this committee is assisted by an Advisory Committee, whose particular duty it is to inquire into the needs of the various general industries, the maintenance of which is not vital to the supply of war material or to the life of the community, but which it is desirable to preserve, if such preservation can be secured without sacrificing interests deemed essential to the successful prosecution of the war. The composition of this Advisory Committee is as under:—

Mr. George E. Alexander.
Mr. Kenneth Chance.
Sir Archibald Denny, Bart.
Mr. Alexander Walker.
Mr. Henry Woodall, M.Inst.C.E.
A representative of the Board of Trade.

The Secretary of the War Priorities Committee is Colonel F. J. Byrne, C.M.G., with offices at 11, Pall Mall, S.W. Applications for priority certificates and permits should continue to be sent to the Priority Departments of the Admiralty and Ministry of Munitions.—*Daily Telegraph.*

Exemption Applications.—At Hull, on January 21st, the city tramway engineer (Mr. J. Wilkinson) applied for exemption for two men, one the driver of the tower wagon (41, Class A), and the other the driver of the rail grinding machine (33, B 1). He said that the retention of the men was necessary in the public interest. Each man was given conditional exemption.

The Coalville Tribunal has granted a final month's exemption to the electric light attendant at Charnwood Towers, aged 40.

At Nuneaton, exemption was claimed by P. Howe (29), electrical engineer, who said that he had a large connection, keeping electrical machinery and appliances going. He was given until June 30th.

Kendal Tribunal heard a National Service appeal against conditional exemption granted to a switchboard attendant (B 4, Grade 3) at the Corporation electricity works. The certificate was substituted by temporary exemption until May 15th.

At Derby, before the County Tribunal, the Derby Lamp Co., metal-filament lamp manufacturers, Derby, appealed for the only male employé left (42, Grade 3). He was given conditional exemption and relieved of Volunteer service.

At Oxford, the National Service Representative appealed against two months' exemption granted to T. Smalley (32, B 1), inspector, and V. Hill (35, B 1), driver, with the Oxford Electric Tramways Co., Ltd. Mr. W. B. Cownie, managing director, said that both men had had considerable experience in technical repairs. They attended to breakdowns, and took the place of drivers. They had made efforts to get substitutes, but without success. The Court dismissed the appeals, and confirmed the exemption.

LEGAL.

BRITISH THOMSON-HOUSTON CO., LTD., *v.* DURAM, LTD.

On the 24th ult., the appeal by the British Thomson-Houston Co., Ltd., from an order of the Court of Appeal (dated March 20th, 1917), affirming a judgment of Mr. Justice Astbury in favour of the respondents Duram, Ltd., was commenced in the House of Lords.

The House consisted of the Lord Chancellor (Lord Finlay), Lords Dunedin, Atkinson, and Shaw.

Mr. Walter, K.C., Mr. Colefax, K.C., and Mr. Gray appeared in support of the appeal; Mr. T. Terrell, K.C., Mr. D. M. Kerby, K.C., and Mr. Courtney Terrell for the respondent company.

The proceedings at the Court of Appeal were reported in our issues of March 16th and 30th, 1917.

MR. WALTER, K.C., in the course of his opening, said the appellants were the plaintiffs, and they sought in the action an injunction to restrain the respondents from infringing Letters Patent No. 21,513* of 1906, granted the appellants for an invention entitled "Process and apparatus for the treatment of metallic tungsten and for the manufacture of metallic filaments therefrom," and Letters Patent No. 17,722 of 1911, granted to John Thomas Henry Dempster for an invention entitled "Improvements in methods of wire drawing," for an inquiry as to damages and usual consequential relief. The trial of the issue of infringement was postponed by consent until the validity of the patents was decided. One patent was held invalid for want of subject matter, the other invalid by reason of prior user. Consequently, the action on both grounds of claim was dismissed. The Court of Appeal affirmed the decision of the trial Judge, and this appeal from that order was brought as to the validity of the 1906 patent only, there being at present no appeal as to the decision on the earlier patent of 1911.

LORD DUNEDIN: Then the substantial question in this House is the validity of the patent.

MR. WALTER replied that that was so.

MR. WALTER, in opening the case, dealt with the history of the subject, and on the following day addressed himself to the specification on which the appellants' patent rested. The appellants' invention consisted in the discovery that a mere built-up body of particles of tungsten could be sufficiently consolidated together by prolonged heating below the melting point, and could then, if worked hot, be treated as though it were a solid piece of metal, and continuous lengths of wire of filament size could be produced therefrom. Counsel described the process in detail, and said that the main ground on which the respondents alleged that the appellants' patent was invalid was want of novelty and subject-matter.

On Monday last the hearing was continued,

Mr. Walter said that the appellants submitted from the first that Moissan's publications disclosed no practical method of producing pure tungsten in a dense coherent form, and were merely a record of experiments which had not assisted in any manner the working of tungsten. There was no evidence before Mr. Justice Astbury that at the date of the trial anyone had succeeded in obtaining a workable body of molten tungsten.

Lord Dunedin: What do you say the learned judge wrongly held to be a ground for dismissing the action?

Mr. Walter: There was no evidence on which he could hold that the appellants' patent was invalid on the ground that the first claim of the specification disclosed no subject-matter, in that it covered the working of fused tungsten while hot, and that the working of a fused metal hot was merely the utilisation of the common tools and routine of the metal worker, and was not the subject of invention at all.

The learned counsel then dealt with the evidence. The hearing was continued during the week.

(To be continued.)

BUSINESS NOTES.

Disposal of A.E.G. Stocks in Australia.—H.M. Trade Commissioner in Australia writes that after the outbreak of the war the Australian Metal Co., Ltd., which was the agent in the Commonwealth for the A.E.G., the well-known German electrical concern, was declared to be an enemy company, and the considerable stocks held in Australia were taken over by the Controller. It has now been decided to dispose of these stocks, and a priced catalogue of the various goods offered for sale has been issued by the Australian Director of Munitions. It is not proposed to dispose of the stocks by public auction, but to realise them gradually, and it is understood that the proceeds will be deposited with the Public Trustee in the Commonwealth. H.M. Trade Commissioner has forwarded a copy of the catalogue referred to, which will serve to indicate to British manufacturers of electrical appliances and machinery the nature of the goods stocked by the German company. The catalogue may be consulted by British firms interested in the Inquiry Office of the Department of Overseas Trade (Development and Intelligence).—*B. of T. Journal.*

French Thomson-Houston Developments.—It is stated that the directors of the Compagnie Francaise Thomson-Houston and of the Eclairage Electrique have decided to amalgamate the two undertakings by the former absorbing the latter, which would be liquidated and its assets paid for by the issue of new Thomson-Houston shares. Immediately after this augmentation of capital it is proposed to make a further emission in order to proceed with the large programme in view, comprising the development of the electrical industry, particularly in relation to the electrification of railways. The present capital of the Thomson-Houston Co. is £2,400,000, and would be expanded to £4,800,000 by the two issues in contemplation. The Eclairage Electrique has largely extended its works during recent years, and its manufactures are partly complementary to those of the absorbing company, which is said to be the leading manufacturing company of its kind in France.

Book Notices.—The issue of *la Revue Générale de l'Electricité* for January 5th contained an editorial note by M. J. Blondin, reviewing the progress of the journal during its first year of existence in its present form, with pardonable pride. We have much pleasure in offering to our excellent contemporary our congratulations on its successful accomplishment of an ambitious and formidable programme, in the teeth of the numerous difficulties which beset all technical periodicals in these days, and we hope it will continue to prosper, under the guidance of its new editor-in-chief, M. Alfred Soulier.

"Annuaire pour l'An, 1918." Paris: Gauthier-Villars et Cie. Price 2 fr.—Besides the usual tables, the Annuaire this year contains articles on "Time at Sea," by J. Renaud; and "The Sun and Terrestrial Magnetism," by M. Hamy.

"The Practical Electrician's Pocket-Book and Diary for 1918." By H. T. Crewe. London: S. Rentell & Co. Price 1s. 6d. net.

"*Proceedings* of the Physical Society of London." Vol. XXX, Part 1. December 15th, 1917. Fleetway Press, Ltd. Price 4s. net.

"B.E.A.M.A. *Journal*." Vol. IV, No. 1. January, 1918. London: Oakley House, Bloomsbury Street, W.C. 2. Price 1s. net.

"The Post Office Electrical Engineers' *Journal*." Vol. X, Part 4. Jan., 1918. London: H. Alabaster, Gatehouse & Kempe. Price 1s. net.

"The Great Debenture: or the Passing of National Unrest." By Cecil Watson. Glasgow: Maclure, Macdonald & Co. Price 1s. net.

Catalogues and Lists.—Messrs. W. T. Henley's Telegraph Works Co., Ltd, Blomfield Street, London Wall, London, E.C. 2.—Two new lists; one (No. U E 0,201), is a 16-page illustrated pamphlet giving tabulated particulars and prices and jointing instructions relating to their indoor wall type vertical terminal boxes. The second list consists of 32 pages, published in French, giving full details of a new range of straight-through and branch boxes for all pressures up to 24,000 volts. In the course of a few weeks a Spanish edition of this list will be issued.

Wardle Engineering Co., Ltd., 196, Deansgate, Manchester.—Illustrated priced leaflet (Catalogue Section "A"), describing a new type of bulkhead fitting (the Wilkinson).

Calendar.—The Victoria Electric Plant Co., of Spencer Street, Victoria Street, Westminster, S.W. 1, have prepared an artistic wall calendar for 1918 with a charming hand-painted water colour view, "Fast Falls the Eventide."

Trade Announcements.—Messrs. Bill & Berry have removed from Great Charles Street to 18-26, Constitution Hill, Birmingham.

The London offices of Messrs. J. Hopkinson & Co., Ltd., have been taken over by the Government, and their address is now Hastings House, Norfolk Street, Strand, W.C. 2. Telephone: No. 3460 Central. Telegraph: "Valvestem, 'Phone, London."

The A.S.E.—The new central premises of the Amalgamated Society of Engineers, in Grosvenor Street, Manchester, are to be formally opened by Mr. J. T. Brownlie, the chairman of the National Executive Council, on Saturday.

Liquidations.—Auxiliary Electrical Co., Ltd.—Winding up voluntarily. Mr. F. R. Reeves, Liquidator, Salisbury House, London, E.C. Creditors' meeting February 4th.

Morris & Lister (London), Ltd.—Meeting March 8th at 36, King Street, Cheapside, E.C., to hear an account of the winding up from the Liquidator, Mr. H. S. Sugden.

Rotherham Electrical Engineering Co., Ltd.—Judge Benson, in the Sheffield Bankruptcy Court, made an order for a compulsory winding up of this company. Mr. E. J. Twigg, for the petitioning creditor, said judgment had been obtained against the company for £744, and the solicitors engaged in the matter agreed by the order.—*Sheffield Telegraph.*

For Sale.—Aberdare U.D.C. has for disposal one automatic reversible battery booster, direct coupled to shunt wound motor, 500/550 volts, 30 B.H.P. For particulars see our advertising pages to-day.

LIGHTING AND POWER NOTES.

Australia.—The Pyrmont electric swing bridge, at Sydney, after 15 years' operation, day and night, without a hitch, came to a stop recently, through the unthought of fracture of a worm on one of the operating shafts. Spares had been provided for every detail likely to break down, but not a spare worm. The broken worm was welded by the oxy-acetylene process, and the bridge was in operation again in 23 hours. In the 15 years of uninterrupted use the swing span has been opened over 97,000 times.—*Commonwealth Engineer.*

Armidale (N.S.W.) City Council has received two offers to install an electric lighting scheme in the town; one proposal is to generate power at an hydro-electric plant on the River Styx, and as the local gasworks is the property of the municipality, an alternative proposal is to purchase this concern and install an electric supply scheme, the two projects being controlled by the one authority.

Bacup.—The Electricity Committee has received notice from the Rawtenstall Corporation of an increase of ·006d. per unit in the price of electricity, owing to the increased cost of coal and wages.

Bradford.—Wages.—In regard to the recent confirmation by the Corporation of the War Wages Committee's recommendation of advances of war bonus from 12s. to 16s. per week for men, 6s. to 9s. for women, and 6s. to 8s. for youths, to date from October 1st last—despite the rejection of this offer by the employés, and a demand that the matter be submitted to arbitration—the War Wages Committee has now decided to arrange for a ballot of all employés concerned, putting the two questions whether they will accept the offer, or have the matter referred to arbitration. This course has been prompted by the gasworkers having stated their wish to accept the offer.

Burnley.—Wages Award.—The Committee on Production has issued its award on the recent arbitration between the Corporation and the Amalgamated Society of Engineers on the claim for the payment of a standard rate of 53s. per week, with overtime rates in addition, on behalf of the switchboard attendants, cablemen, wiremen, and motor superintendent in the Corporation's electricity department. The award is to the effect that the claim has not been established.

Continental.—France.—M. Dumas, Deputy of the French Chamber, has asked the French Minister of Public Works whether Article (3) of the Law of June 10th, 1917, concerning the maximum utilisation of hydro-electric energy, has been carried into effect; and if so, where and under what conditions. Reply: The maximum utilisation of electric power has been, and is still being, carried out in a permanent manner by the various services concerned. In fact, the Law in question has been applied in ten different Departments of France (named). As regards the conditions, these could not be published for various reasons. In 64 Departments the Law has not been put into effect, for insufficiency or absence of electric plant. In 12 other Departments the Law is in course of application, and efforts are still being made to give full effect to it.

Italy.—A new company has lately been formed in Rome with a capital of £12,000 and the title La Società delle Forzi Idrauliche Italiane, with the object of establishing plants for the utilisation of water power in the generation of electrical energy.

Glasgow.—Price Increase.—At a meeting of the Electricity Committee the engineer reported that the increase of wages, granted since November last, would entail on the electricity department a further additional expenditure during the current financial year of about £16,000, to meet which a further increase in the charges for electrical energy would be necessary, and the

Sub-Committee, after considering the report, agreed to recommend to the T.C. that, as from and after the date of last survey until May 31st next, (1) that the charges for electrical energy per unit be increased by 10d. on current rates; and (2) that the KW. rate be increased by 15 per cent.

High Wycombe.—PUBLIC LIGHTING CONTRACT.—The dispute between the T.C. and the Electricity Co. with reference to the public lighting contract, owing to restricted lighting, has been settled, and the threatened litigation averted, and a new contract for seven years, from January 1st, 1916, has been agreed upon and signed.

Newport (Mon.).—PLANT EXTENSIONS.—The T.C. has agreed to the Electricity Committee's recommendations for extending the plant at the East power station, and application is to be made to the L.G.B. for sanction to borrow the necessary money and to the Ministry of Munitions for permission to proceed with the scheme. The extensions include a 3,000-KW. turbine set, with condensing plant, switchgear, &c., £31,118; 250-K.V.A. transformer and switchgear, £753; 120-H.P. motor for auxiliary plant for existing 3,000-KW. turbine set, £715; turbine-driven feed pump, £638; and extension of boiler house, £2,290; total, £35,514.

In a report on the subject, Mr. Nichols Moore, the borough electrical engineer, considered the alternative of linking-up with the South Wales Power Co., but found that if a 1,500-KW. supply only were obtainable the cost on the basis of a 22/30,000-volt transmission from the nearest available point of connection at Risca would be £30,000. Moreover, frequency changers would be required, or in the alternative rotary converters could be used to supply direct current, though the demand for the latter would be limited to 1,000 KW.; the latter arrangement would in practice preclude the possibility of a reciprocal supply, and would not furnish any direct stand-by to the existing three-phase plant.

As regards the National Electric Supply proposals, Mr. Nichols Moore points out that it may be many years before a concrete scheme materialises.

New Zealand.—A conference of local bodies of South Canterbury and Ashburton, at Timaru, recently passed a resolution calling upon the Government to fulfil its promises in regard to hydro-electric supply in that district before undertaking new schemes in the North Island.—*Auckland Weekly News.*

Normanton.—The U.D.C. is opposing the Yorkshire Electric Power Co.'s Bill on principle, though the town will not be materially affected.

Radcliffe.—For the first time since the electricity works were opened 14 years ago, there was a total failure of the supply on Thursday, last week. The bulk supply from Bury was interrupted, and for a period of seven minutes, before the staff got the local plant into operation, there was a total suspension of current in the district. The staff had to depend entirely upon the local plant for some three or four hours.

Stockton-on-Tees.—PRICE INCREASE.—The Corporation has increased the scale of charges for electric lighting and special rate power consumers by ½d. per unit, as from January 1st.

Tasmania.—Mr. J. H. Butters recently announced that a London company had inquired for 400 H.P., to be increased to 2,000 H.P. in the near future, for use in a works to manufacture a product for sale throughout the southern hemisphere. The Launceston City Council has agreed with the Government to meet the requirements from hydro-electric sources.

United States.—According to the *American Electrical Review*, over 4,000 communities are now quoting special rates for electric range cooking of 5 cents or less per unit. Electric ranges are rapidly coming into use, 100 central stations reporting over 14,000 connected up. The United States Fuel Administration has issued an order under which the "white ways" of all cities are to be discontinued on two evenings of each week. Exceptions are made in the case of Government lights, but no "white way" or cluster of lights will be permitted under any circumstances. It is strongly urged that hydro-electric companies co-operate in this, though the ruling does not cover hydro-electric power. An order of a similar kind has been issued in regard to electrically illuminated advertising signs, illumination on buildings, searchlights, &c. This order does not, apparently, apply to illuminated names on business houses, or to names of plays, &c., at theatres.

The American authorities have given assurances to the Canadian Government that approximately 100,000 electric H.P. imported from Canada will be used only for the manufacture of war products. The War Industries Board is developing plans for a redistribution of electric power supply in Buffalo and other cities. Industries of less importance are to be curtailed in their use of power.

Yorkshire Electric Power Co.'s Bill.—The Pudsey T.C. has given instructions for the protection of its interests with reference to the above Bill. The Bingley Council and the Skipton R.D.C. are taking steps to oppose the Bill.

TRAMWAY AND RAILWAY NOTES.

Australia.—The electrification of the Melbourne suburban lines has now reached a stage where the provision of a comparatively small amount of plant will allow electric trains to run on the Sandringham-Essendon line and a further addition to the equipment will place the Williamstown, St. Kilda, and Port Melbourne lines in commission. Much of the overhead work is complete; many sub-stations are built and awaiting plant, and the Jolimont car shed is complete and cars are being equipped there.—*Melbourne Age.*

Canada.—MONTREAL TERMINAL ELECTRIFICATION.—The electric zone of the Canadian Northern Railway extends about 10 miles, from passenger station in the city of Montreal, through the Mount Royal Tunnel 3½ miles long, to the village of Cartierville, where a freight yard is established. The electrification is on the 2,400-volt direct-current system, and has been in operation for a considerable period for hauling spoil from the station excavation. Power is purchased at 11,000 volts, three-phase, 60 cycles, and delivered to a sub-station at the Mount Royal portal of the tunnel, being there transformed by 1,500-KW. motor-generator sets, each consisting of an 11,000-volt synchronous motor driving two 750-KW. compound-wound commutating pole generators wound for 1,200 volts, insulated for 2,400 volts, and permanently connected in series. The shunt fields are separately excited. The pole face winding and the series and commutating field windings are all connected on the ground side, so that the armatures are the only parts subjected to the full potential of 2,400 volts.

Three motor-generator exciter sets are provided for exciting the fields of the synchronous motors and generators. Transformers supply small motors and lighting, and a battery is installed for emergency lighting and to operate the oil switchgear in case of a complete shut down. Catenary cross-span overhead construction is employed; the messenger is ¼ in. seven-strand steel cable, with supports spaced 150 ft. apart, and the trolley wire is 4/0 B. & S. special bronze supported every 15 ft. by loop hangers.

Inside the tunnel the messenger cable is of phosphor bronze, supported every 9 ft. by iron yokes hung from the roof. Two bronze trolley wires are hung side by side by hangers at 15 ft. intervals from each messenger cable; the two trolley wires are employed to reduce wear and limit by additional weight the wave height of the wire when a trolley passes, this being essential on account of the small clearance. The rail bonds are of the ribbon type electrically welded to the rails.

Six 85-ton locomotives geared for a running speed of 45 M.P.H. are employed. Each locomotive has four axles, each twin-gear driven from a 315-H.P., 1,200-volt motor, two motors being permanently connected in series on the 2,400-volt trolley circuit. The motors are of the commutating pole type insulated for 2,400 volts. The locomotives are operated as two-speed machines, with ten points in series and nine points in series parallel. Current at 125 volts for operating the contactors and lighting, is supplied by a motor-generator set, the motor of which has two 1,200-volt windings and two 1,200-volt commutators in series. The air brake compressor is also driven by two 1,200-volt motors in series.

Multiple-unit trains are to be adopted for the local service, the motor coach equipment including four 125-H.P., 1,200-volt motors, connected two in series. The control is of the non-automatic type for multiple-unit operation; 600-volt current for the contactor circuits, air compressor, and lighting circuits is supplied by a motor-generator. An electric hot air system for car heating is employed, one 42-KW. heater being placed under each coach.

Colwick.—An inquiry has been held into an application promoted by the Nottingham Colwick Estate Co. for the construction of a light railway at Colwick, Notts., in connection with a scheme of industrial development in the district.

Hebden Bridge.—Negotiations are proceeding as between Halifax Corporation, Hebden Bridge Council, and Todmorden Corporation for the bridging of the gap of a mile, within the Hebden Bridge area, in what would otherwise be a continuous tramway and motor-bus service connecting up Lancashire and Yorkshire. The scheme is for the extension of the Halifax tramways to Whiteley Arches, to be met there by the extended running of the Todmorden motor-buses. Halifax Corporation agrees that the venture would probably be a paying one, but lays down the conditions that all cost of road widenings should be borne by Hebden Bridge, that net profits or losses on the running of the new section should be shared equally between Halifax and Hebden Bridge, and that the latter should extend for a period of 21 years the lease for the Halifax tramways in its area.

Keighley.—The electric railless traction service between Keighley and Oakworth, which was recently suspended, has now been resumed.

London.—L.C.C.—The new regulations relating to the change points for transfer tickets to and from the tramway subway came into force on Monday. To meet the congestion of traffic at the Victoria tramway terminus in Vauxhall Bridge Road during the rush period, every evening and after 12 noon on Saturdays, passengers must leave the cars by the front platforms after the cars have passed the new cross-over which has just been completed, to facilitate a more speedy clearance of the cars leaving the terminus.

Pontypridd.—ELECTRIC VEHICLES.—In a report, the engineer of the U.D.C. gives the result of working two 2-ton Edison refuse vehicles during the last six months of 1917. These vehicles cost £1,020 each; the tires are guaranteed for 10,000 miles, and 1d. per mile is allowed for renewals. The charges during the period, including interest, sinking fund, insurance, renewals, &c., were £410, and operating costs, £761; 4,730 tons were carried, making the cost per ton 3s. 2·9d., as against 1s. 6d. to 5s. per ton

by horse haulage; 2·8 units were used per mile, the rate for energy being 1½d. per unit. The saving of 1s. 6d. per ton represents £354. A third vehicle has been added, and another is being obtained.

Stalybridge.—At the monthly meeting of the Joint Tramways and Electricity Board it was resolved that the precept for the deficit on the tramway undertaking be £5,000, to be levied in equal portions of £1,250 on each of the four Corporations. Alderman John Bradbury, chairman of the Finance Committee, said that two years ago they issued a precept for £7,000 to meet a deficit of £10,000, and the following year they levied a precept for £7,000, which met the liabilities of that year and paid up the £3,000 of the previous year. Last year they issued a precept for £5,000, and this year, if they could have been quite sure as to the course of next year, they might have been able to do with less than £5,000. But they were faced with the prospect of a greatly increased expenditure, and wages alone seemed likely to take £5,000 or £6,000 additional, and they thought it a prudent step to make the levy they were doing. The precept was approved.

West Ham.—In regard to an application by the Council to the B. of T. for sanction to borrow £3,500 for the purchase of 20 car bodies for the tramway undertaking, the Ministry of Munitions has written suggesting that the best means of relieving the situation would be by the transfer of cars from other less important lines. In the event of such arrangement, involving the purchase by the West Ham Corporation of the cars so transferred, the Corporation should have the necessary facilities to raise the loan for the purchase of such cars. No final decision has yet been arrived at.

Yorkshire (West Riding).—Batley and Staincliffe people are much upset by the suspension of the morning tramway service on the Thorncliffe Road route by the Yorkshire (Heavy Woollen District) Electric Tramways, Ltd. A protest against the suspension has been made by the Infirmary Committee of the Staincliffe Institution and endorsed by the B. of G., and it has asked the Batley T.C. to support it.

TELEGRAPH AND TELEPHONE NOTES.

China.—According to information received from Tien-Tsin, attempts made by German interests to install Telefunken wireless stations throughout China have been frustrated. The position of the Marconi Wireless Telegraph Co., under the agreement signed in 1914, has been definitely established by the British Legation at Pekin.—*T. and T. Age.*

France.—It is announced that the Compagnie des Cables Télégraphiques is participating in the formation of the Société de Radio-Télégraphie, which will have a share capital of £500,000, divided into 25,000 £20 shares. Of the total, the former company will subscribe 30 per cent., the Marconi group 40 per cent., and the balance will be taken by the Banque de Paris and the Banque Française. The new company will absorb two concerns which manufacture apparatus for wireless telegraphy, whilst the Marconi group will bring in a wireless station established at New York by the United States subsidiary. The Société Française Radio-Electrique states that it will not take any part in the new company, and that it is not disposed to be absorbed by anyone.

Italy.—The telegraphic rates for foreign countries will be raised by 40 per cent. from February 1st, in view of the high rates of exchange.

U.S.A.—Wireless communication has been established between Italy and the United States.

Peru.—A wireless station, designed to communicate with Bolivia, Chile, Argentina, Uruguay, Paraguay, and Brazil, was inaugurated at Cachendo (Peru) in December last.—*Review of the River Plate.*

United States.—The chain of high-power wireless stations, whose construction was authorised by Congress in 1912, was completed in December by the opening of the Cavite station, Philippine Islands. The stations comprising the chain are:—Arlington, Darien, San Diego, Pearl Harbour, and Cavite.

Through the organisation of the Pan-American Wireless Telegraph and Telephone Co., a new Delaware corporation, a chain of high-power stations will be erected which will connect the United States with Mexico, and Central and South America, for commercial wireless communication. Work will begin on the United States and Argentina stations immediately. The new corporation has acquired the right to use all patents and concessions of the American and English Marconi Companies, and the Poulsen-Petersen system.

The Marconi Wireless Telegraph Co. of America, through its large interest, which amounts to a control, in the Pan-American Wireless Telegraph and Telephone Co., has extended its zone of activities so that it now will be able to cover all America, whereas it has heretofore been confined to the United States and dependencies, all foreign stations having been under the control of foreign corporations.

Mr. Edward J. Nally has been elected president of the Pan-American Wireless Telegraph and Telephone Co., and the Honourable John W. Griggs, chairman of the Board.—*T. and T. Age.*

CONTRACTS OPEN AND CLOSED.

OPEN.

Australia.—Melbourne.—April 5th. Department of the Navy. Motor-driven hydraulic pump. Director of Navy Contracts, Melbourne.

February 2nd. Waterworks department. Electrically-driven radial arm crane. See "Official Notices" January 4th.

Adelaide.—February 27th. P.M.G.'s Department. Telephone material. Schedules 479 and 483. See "Official Notices" January 18th.

Belfast.—February 7th. Telegraph ironwork, wire, batteries, electric lamps, carbons, &c., for the Midland Railway Co., Northern Counties Committee (Ireland). Mr. Ellis, Stores Superintendent, York Road Station.

Manchester.—February 12th. Tramways Department. General stores, including electric lamps, insulating material overhead equipment, &c. See "Official Notices" to-day.

Newport (Mon.).—February 18th. Electricity Department. One 3,000-kw. turbo-alternator and surface condensing plant. See "Official Notices" to-day.

CLOSED.

Government Contracts.—The Alpha Manufacturing Co., of Balham, S.W., have lately received a number of lighting installation contracts, including lighting for the Science Museum, the Western Galleries of the Kensington Museum, and plant or lighting, or both, for a number of Government factories.

Leeds.—Messrs. R. H. Longbotham & Co., Ltd., Wakefield, have acquired by tender generating plant from the Leeds Corporation Electricity Works, which is being replaced by larger plant.

West Ham.—The T.C. has approved arrangements made by the electrical engineer, with Messrs. Brunner, Mond and Co., for a five years' contract for alkali for the water softener at the generating station. The engineer is to purchase unslaked lime on the best terms possible.

FORTHCOMING EVENTS.

London Association of Foremen Engineers.—Saturday, February 2nd. At 7 p.m. At Cannon Street, Hotel, E.C. Discussion on "Scheme for the Encouragement of the Better Training of Lads in Engineering Workshops."

Chief Technical Assistants' Association.—Saturday, February 2nd. At 3 p.m. At the Tavistock Hotel, Covent Garden. Ordinary meeting.

Royal Society of Arts.—Monday, February 4th. At 4.30 p.m. At John Street, Adelphi. Cantor Lecture, "High Temperature Processes and Products," by Mr. C. R. Darling. (Lecture III.)

Tuesday, February 5th. At 4.30 p.m. Paper on "The Industrial Resources of South Africa," by Mr. C. du P. Chiappini, Trades Commissioner for the Union of South Africa.

Wednesday, February 6th. At 4.30 p.m. Paper on "The Development of the Mineral Resources of the Empire," by Prof. W. Frecheville.

Roentgen Society.—Tuesday, February 5th. At 8.15 p.m. At the Royal Society of Arts, John Street, Adelphi, W.C. 2. Papers on "A Simple Means of Obtaining Static Currents from an Induction Coil," by Mr. G. B. Batten, and "A Mobile Snook Apparatus," by Mr. E. E. Burnside.

Institution of Civil Engineers.—Tuesday, February 5th. At 5.30 p.m. At Gt. George Street, S.W. Paper on "The West Quay of Madras Harbour," by the Hon. Sir F. J. E. Spring, and Mr. H. H. G. Mitchell.

Institution of Electrical Engineers.—Thursday, February 7th. At 6 p.m. At the Institution of Civil Engineers, Gt. George Street, S.W. 1. Ninth Kelvin Lecture, "Kelvin as a Teacher," by Prof. M. Maclean.

(Dublin Local Section.)—Friday, February 8th. At 8 p.m. At the Royal College of Science, Upper Merrion Street. Ordinary meeting.

(Students' Section).—Friday, February 8th. At 7 p.m. At Faraday House, Southampton Row, W.C. Paper on "Magnetos," by Mr. R. W. Corkling.

Midland Electric Power Supply Engineers' Association.—Thursday, February 7th. At 7.30 p.m. At the White Horse Hotel, Congreve Street, Birmingham. Annual general meeting.

Greenock Electrical Society.—Thursday, February 7th. At 7.45 p.m. At 22, West Stuart Street. Paper on "Armature Winding," by Mr. W. R. Scott.

Royal Institution of Great Britain.—Friday, February 8th. At 5.30 p.m. Lecture on "Science and Ethics," by Prof. E. H. Griffiths, F.R.S.

North of England Institute of Mining and Electrical Engineers.—Saturday, February 9th. At 2 p.m. At Neville Hall, Newcastle-on-Tyne. Ordinary meeting.

NOTES.

The Red Light!—The Leeds Nineteen Club has adopted a system of electric lamps in order to set a limit to the duration of speeches. On the chairman's table are three electric bulbs, coloured white, green and red. A time limit upon speeches having been decided upon, the chairman, with a stop-watch on the table before him, puts on the white light when a speaker begins. When the limit is getting near, the green light gives warning, and the end of the time is quietly indicated to garrulous speakers by the red light.

Employment in the Iron and Steel Trades.—The Minister of Labour has appointed the Iron and Steel and Kindred Trades Central Advisory Committee (Employers) to advise and assist the Ministry of Labour on questions arising in the administration of the Employment Exchanges which affect employers in that industry.

The Metric System.—As "signs of the times," we note with interest the contents of two price lists for terminal and junction boxes, recently issued by Messrs. W. T. Henley's. One of these is printed wholly in French; naturally, therefore, the dimensions of the conductors and of the boxes are given in millimetres, the weights in kilograms, and the prices in francs, though the sizes of the fixing bolts remain in inch measure. But the other is in English, and in this case also all the dimensions of the boxes are again *given in millimetres only*. Comment is unnecessary.

Electric Lamp Stealing.—At Southport, last week, four boys were charged with stealing 22 electric lamps from a station on the L. and Y. Railway. The lamps were valued at £2 2s. It was stated that the bulbs had been taken from the fittings at the station, and none of them had been recovered. To get at them the boys would have to climb eight or nine feet. Two of the lads said they took the lamps in order to burst them and "make an explosion." A further charge against three of the lads was of stealing six electric lamps from the Southport band enclosure, and it was stated that 81 bulbs had been missed since October. The lads were ordered to pay the cost of the lamps and their parents were bound over.

The 12½ per Cent. Bonus.—According to the *Times* it is officially announced that a large number of cases arising out of the Orders under which a bonus to munition workers has been given have been referred by the Ministry of Labour to the Committee on Production or to the Special Arbitration Tribunal, and decisions have been given in the five following cases:—

Platers and Riveters, Yarrow & Co., Ltd.—Entitled to the 12½ per cent. bonus.

Poilermakers, Gun-Mounting Department, W. Beardmore & Co., Ltd., Dalmuir.—Not entitled to the 12½ per cent. bonus, but will receive a bonus of 7½ per cent. on earnings.

Water Testers, W. Beardmore & Co., Ltd., Dalmuir.—Not entitled to the 12½ per cent. bonus, but will receive a bonus of 7½ per cent. on earnings.

Engineers, Moulders, and Electrical Fitters.—Mond Nickel Co., Ltd., Clydach.—Entitled to receive the 12½ per cent. bonus.

Engineers and Ironmoulders, Baldwins, Ltd., Panteg.—Entitled to receive the 12½ per cent. bonus.

In a circular forwarded by Mr. H. Faraday Proctor to the members of the I.M.E.A., several points in connection with the award are elucidated, in reply to queries addressed to him. The Bristol Electrical Committee has decided to give the 12½ per cent. award to *all* employés of the department (both sexes) who are in receipt of a net wage or salary (exclusive of any bonus) not exceeding £250 per annum. Officials with higher salaries are to be dealt with according to any recommendations that may be made by the Joint Executive of the I.M.E.A. and other Associations. The 12½ per cent. addition is applied to the net wage or salary and also to the bonus already given.

Subject to any awards or arrangements made locally, no bonus except the 12½ per cent. is compulsory. It is not obligatory to raise existing bonuses to £1 per week. The expression "plain time working employé" does not include men paid an upstanding wage. "Technical staff" does not include general clerical staff, although it may include some of them. The 12½ per cent. is to be reckoned on the ordinary pay, plus overtime, plus war bonus.

Coal Conservation and the National Electricity Scheme.—The opening address of a series of lectures on reconstruction problems, to be delivered in Dewsbury, was given by Mr. W. B. Woodhouse, chief engineer and manager of the Yorkshire Electric Power Co., who dealt with the subject of "Coal Conservation and the National Electricity Scheme." Mr. Woodhouse pointed out the necessity of increasing the productivity of labour, thereby requiring the use of more power, but, at the same time, not reducing the quantity of fuel available for export.

In the U.S. the production of coal per man was 660 tons, as against 250 tons in Great Britain; in the textile clothing trade, the annual value of the production per person employed in the U.S. was £484, as against £158 here; the primary cause for the difference was that American industry used approximately three times as much power as was used here in corresponding trades. The solution of the problem was the more economical use of fuel and the cheapening of power supply, the one being a consequence of the other. Mr. Woodhouse went on to refer to the Coal Conservation Sub-Committee's recommendations, and to trace the development of public electricity supply in this country, pointing out the difficulties which had prevented the power companies from attaining success.

The cost of producing power depended on the size of the generating plant and the regularity of its use.

The capital expenditure on a station of 100,000 KW. would be no more than that on 50 stations of 1,000 KW. each; therefore, a clear saving of half the cost of small stations could be effected, and the same total output be given.

The larger station should not use more than 1½ lb. of coal per unit, while in small stations it varied from three to six times as much.

The annual output of the Yorkshire coalfield was some 40 million tons, of which approximately 12 million tons were used in the West Riding for power purposes. Existing undertakings were supplying not more than one-twentieth of the power, and if all the power were produced electrically, a saving of at least 50 per cent. could be made.

If the Yorkshire collieries were connected on the power supply systems, the saving in their own coal consumption would be more than enough to generate all the power required by the Yorkshire textile mills.

There were 27 independent authorities supplying electricity in the West Riding, mostly on a small scale from unsuitable sites.

Large power stations might have to be built at some distance from the centre of the area, with a view to water facilities, but there were no technical difficulties in the transmission of power.

As regards the handling of the national scheme, small company and municipal concerns should be taken over, and, with goodwill on both sides, there should not be any real obstacle to a joint working arrangement between the large power companies and large municipalities.

Personally, he felt that progress would be most rapid if the Reconstruction Committee's preference for company management were accepted; if, however, the municipalities desired to continue with the business, some means of association between them and the companies would be necessary by which they would share in the provision of capital and in the profit resulting from the work done.

Glasgow Tramcar Accident.—At an inquiry under the Fatal Accidents (Scotland) Act, into the circumstances attending the deaths of three men who lost their lives in the accident to a Glasgow T.C. tramcar recently, the jury added the following rider to a formal verdict:—"We are of opinion that the accident was caused by the tramcar taking the curve at excessive speed, and through the brakes not being applied soon enough. Owing to insufficient light the driver failed to see the curve in time to prevent an accident. We recommend that the stopping-place at this, and all similar curves, be placed before the curve, instead of in or round the curve."

Fatality.—A verdict of "Accidental death" was returned at Wigan, last week, on Elias Ashcroft (39), of Appley Bridge, employed as an electrician at Messrs. Thomas Witter & Co.'s linoleum works, Appley Bridge, who died as the result of falling into a vat of boiling linseed oil at the works.

Industrial Reconstruction Council.—The Lord Mayor will preside at the inaugural meeting of the Council on Friday, February 15th, at 3 p.m., at the Guildhall, London. Dr. Addison, Mr. G. H. Roberts, Lord Burnham, Mr. J. H. Whitley, and other speakers representative of industrial interests will deal with the practical problems of industrial reconstruction. This is the first of a series of important meetings which the Council is arranging with the object of focusing public opinion upon the industrial problems that will arise at the end of the war. Applications for tickets should be made to the Secretary, the Industrial Reconstruction Council, 8, Bouverie Street, E.C. 4.

Inland Transport.—The *Times* understands that the question of the control of all forms of inland transport—except the railways, which will be controlled, as heretofore, by the Railway Executive—is engaging the immediate attention of the Government. Important develpments may be expected shortly.

Meters on a Changed Frequency.—Replying further to "Query" on this subject, "T" (Urmston) states that the figures given in his former letter were the actual figures obtained on meters calibrated for 50 periods and tested at 40 periods on inductive and non-inductive loads. As the loads are all non-inductive, and in view of the small errors produced, there is no need for "Query" to retest his meters. The figures quoted cover four out of the five types of meters which are in use.

An Enlightened Trade Union.—Hull Education Committee draws attention to a somewhat remarkable development in connection with the training of apprentices. The boiler makers of Messrs. Earles' Shipbuilding Co. met together and impressed upon the apprentices the necessity of joining technical classes, and undertook to advance to them the fees and cost of books and materials, to be repaid by instalments. As a result of this, one class of 35 boiler makers' apprentices was entered at Craven Street. This is an almost unique case in engineering, of an organisation of workmen distinctly bringing pressure to bear on the apprentices in this way. Further, the Boiler Makers' Society has also been bringing strong pressure to bear on elder apprentices, to join a special class in boiler makers' work that has been opened at the Technical College.

The Electrification of Railways.—Discussing a paper by Mr. Kirkland, which was read before the South African Institute of Electrical Engineers, Mr. F. W. Mills, chief electrical engineer of the South African Railways, stated that the section best adapted for electrification was that between Ladysmith and Durban, on which a through goods train could not take more than 650 tons. If they increased the load to 1,000 tons and doubled the speed by electrification, which could easily be done, the duplication of the single line could be deferred. Coal was cheap, and the displaced steam locomotives could be used at once on some other part of their large railway system. An exhibition of views of the Chicago, Milwaukee, and St. Paul Railway which Mr. Kirkland had given to the senior railway officers and others had been of educational service, and gave them clear ideas of what electrification meant, and would be the means of securing a far more sympathetic treatment of the subject than could otherwise have been obtained. A representative of Messrs. Merz & Maclellan was investigating the subject for the Administration.

Long-lived Electric Vehicles.—Five electric trucks purchased in 1899 by a New York firm of silversmiths are in use to-day. The cars were manufactured by the Riker Co.; other one and two-ton trucks were added a year or so after the original ones. While these are probably the oldest commercial electrics still in service, says an American contemporary, others have been in use for a long time, and 10-year-old installations are not uncommon.

Engineer Sentenced.—At the Old Bailey, on Wednesday, Alfred Horswill Gibbings, aged 51, an engineer who had been engaged in the Machine Tool Department of the Ministry of Munitions since November, 1916, was sentenced to four months' imprisonment in the second division for attempting unlawfully to communicate information obtained, owing to his official position, to a correspondent in Switzerland. It appears from the Press reports that prisoner, who was in receipt of £400 a year, which was advanced to £500, complained that he could not live on that salary, and that he proposed to form a syndicate of Swiss manufacturers to trade here in machine tools. Correspondence was intercepted by the Censor. Defendant said that at the time he did not know he was doing wrong.

The Féry Primary Cell.—At the meeting of the Société Internationale des Electriciens on January 3rd, M. Ch. Féry gave further particulars regarding his cell, which has been adopted successfully by several railway companies. He showed that the depolarisation of the cells is not proportional to the geometrical surface of the carbons, but to their active surface, which may be much greater, and that their working depends on their purity and that of the sal-ammoniac solution. The output curve of these cells at constant current is practically the same as the discharge curve of an accumulator; a Féry cell gave 95 ampere-hours per gramme of sal-ammoniac, and the output of the zinc electrode was 95 per cent., a value never previously attained. The cell was described in our issues of August 10th, and December 7th, 1917.

An Australian Industrial Agreement.—We are indebted to Mr. H. R. Harper, city electrical engineer, Melbourne, for particulars of an agreement which was recently entered into between the City Council of Melbourne and the Federated Engine Drivers' and Firemen's Association of Australasia. A Conference had been called by the President of the Commonwealth Court of Conciliation and Arbitration between the parties, in June, 1916, but agreement was not attained, and the questions at issue were referred to the Court. But in the meantime, the parties conferred in March, 1917, and agreed to settle all the questions in dispute, with a view to securing industrial peace. It was resolved that the terms should hold good for three years, no matter whether the conditions of life, cost of living, or other factors varied or not during that period, and that if either of the parties, or any member of the Association, made application to the Court or any Wages Board and secured an award varying the code, the party suffering damage by such award should be entitled to repayment therefor by the other party.

The code of regulations sets forth that eight hours shall constitute a day's work, and that overtime shall be paid for at the rate of time and a half on week days and double time on Sundays, except when worked by arrangement between the employés or for the purpose of changing shifts, &c. Six consecutive working days' annual leave are to be granted, as well as nine consecutive days in lieu of the public holidays, making a total of 15 days with pay, after 12 months' service.

Sunday duty is to be paid for at time and a half. The scale of wages is to be as follows:—

	s.	d.
Engine drivers in the power house ... (per day)	13	6
Assistant engine drivers (with first-class certificates)	12	6
Leading firemen	13	0
Firemen	11	6
Trimmers	10	6
Ash men	10	0
Conveyor attendant	11	0
Switchboard attendant	13	0
Sub-station attendant	12	6
Dynamo attendant	10	6

When the capacity of the plant under load does not exceed 10,000 KW., at least one driver and one attendant shall be employed, and for every additional 5,000 KW. an additional assistant: Where mixed duties are performed in any one day, the wages are to be based for that day on the highest scale involved. Men cleaning boilers or economisers are to receive 6d. an hour extra, and men cleaning straining pits or crank chambers 1s. 6d. an hour extra. One fireman is to be employed for every six boilers under steam, with a margin of one boiler per man; not exceeding four boilers, one leading and one ordinary fireman; ditto six boilers, + one trimmer; ditto nine boilers, + one fireman; ditto 14 boilers, + one trimmer.

This agreement was signed by the parties on September 18th, 1917, and was certified by the Court on October 18th, 1917. It will be seen that it constitutes a sincere and praiseworthy attempt to ensure industrial peace for at least three years, and we trust that it will be as successful as it deserves to be.

The Grouping of Cells in a Battery.—The publication of a letter on this subject in our last issue, under the heading of "Prof. Walker's Battery Rule," has called forth a protest from Prof. Miles Walker, who disclaims the invention of any rule in connection with batteries; we regret, therefore, that we have been the means of unjustly attributing to him the enunciation of a rule which is alleged to be inaccurate.

From a perusal of the correspondence which has passed between the Principal of the Manchester School of Technology and Mr. W. F. Dunton, we gather that the latter initiated the discussion in September last, in pursuance of a pet idea which he has nursed for many years. In our issue of November 9th, 1906, page 746, we reviewed his book on the "Grouping of Electric Cells," and pointed out that the subject was of no practical importance; we still hold this view, and approve of the Manchester decision to defer the discussion to the conclusion of the war—or, for that matter, of the century.

Travelling Tramcars for New Municipal Kitchens.—The services of Mr. G. W. Holford, the general manager of the Salford Corporation tramways, have been requisitioned on behalf of the Ministry of Food. The Mayor of Salford on Monday received a letter from Alderman Spencer, chairman of the Halifax Corporation tramways (who commenced his duties last Monday as director of the Central Kitchens Division), asking that Mr. Holford should be released in order to be assistant director of the scheme, a part of which is to provide travelling kitchens to run on the existing tramway lines in different areas, and thus get a speedy and better distribution.

The request will be considered by the Salford Tramway Committee at an early date.

Conditions in Mexico.—Owing to the chaotic conditions existing in the mining section of Mexico, especially in the States of Guanajuato, Jalisco, Michoachan and San Luis Potosi, American miners are fleeing from that district to escape Mexican bandits operating there. The large hydro-electric plant of the Guanajuato Power and Light Co., at El Duro, Michoachan, has been partly destroyed and is out of commission, and much transmission cable has been carried off, resulting in the shut-down of many mills, smelters, irrigation plants, industrial establishments, &c., which were dependent upon the power plant for service. The company is composed of Americans, with stock owned by men of Colorado Springs, Colo. It will take several months to repair the damage sufficiently to resume operations.—*Electrical Review*, U.S.A., December 22nd.

Volunteer Notes.—London Army Troops Companies, Volunteer Engineers.—Headquarters, Balderton Street, Oxford Street, W. 1.

Orders for the week ending February 9th, 1918, by Lieut.-Colonel C. B. Clay, V.D., Commanding.

Officer for the Week.—Second Lieut. E. A. Ullmann.
Next for Duty.—Lieut. C. E. Campbell.

Monday, February 4th.—Recruits' Drill, 6.30—8.30. Signalling Section, 6.30—8.30.

Tuesday, February 5th.—Lecture on "Demolitions," at 6.30. Physical Drill and Bayonet Fighting, 7.30.

Wednesday, February 6th.—No. 1 Company, Entrenching, &c., 6.30—8.30. Recruits' Drill, 6.30.

Thursday, February 7th.—No. 2 Company, Entrenching, &c., 6—8. Recruits' Drill, 6.30—8.30. Signalling Section, 6.30—8.30. Ambulance Section, 6.30—8.30.

Friday, February 8th.—Musketry, 5.30—8.

Saturday, February 9th.—Knotting, &c., for the whole corps, 2.45—4.45. Musketry, 2.45—4.45.

All drills will take place at Headquarters, unless otherwise stated.

(By order) Macleod Yearsley, *Capt. and Adjutant.*

Warwickshire Volunteer Engineers.—We have received a neat folder issued by this Corps (H.Q. at Drill Hall, Thorp Street, Birmingham), giving in convenient form the Morse alphabet, official prefixes, code time, and the special signals in use in the Service.

Electric Time Signals.—A new type of time signal has recently been installed at the Hector Observatory, Wellington, N.Z. Three electric lamps are mounted in a vertical row on the observatory flagstaff, 6 ft. apart—the lowest green, the middle red, and the highest white. The lights are switched on 15 minutes, 10 minutes, and 5 minutes respectively before the hour of the signal, at which hour they are all extinguished simultaneously. The signals are given at 20 hours, 21 hours, and 22 hours Greenwich mean time.—*Electrical Trades Journal.*

Customers and Population.—The Society for Electrical Development, of New York, has recently issued a compilation showing the proportion of residence customers served to population served by the various central stations in the U.S.A. during 1917. The Society considers that there is a great demand for an accurate, complete electrical census—not guess work—and it is one of the purposes of the Society to get this information for the use of its members. It is considered that such information will be valuable to manufacturers and contractors as an indication of possible development work.

Portsmouth Dockyard School.—At the recent annual prize distribution, presided over by the Admiral Superintendent, supported by the staff and other dock-yard officers, the headmaster presented his annual report. A year of steady progress and inter-school successes has been made noteworthy by the following special achievements of the Fourth-Year Students:—G. Bryant, A. G. Stickly, and H. T. Johnson appointed to cadetships in Naval Construction; Mr. Scott, first place in competition for Army Cadetships to Woolwich, &c.; R. Baillie, awarded Whitworth Scholarship; nine other Fourth-Year Students awarded Whitworth Exhibitions. There are now over 400 apprentices under instruction at the school, and among other organisations the apprentices have a flourishing Cadet Corps, which has the reputation of being "the best Cadet Corps in Hampshire."

Remuneration of Professional Men in Australia.—The Australian *Chemical Engineer and Mining Review* states that the Queensland Industrial Arbitration Court has given judgment in a case in which the employés of the Railway Department petitioned for a wages award. The powers of the Court have been limited by regulation to the fixing of salaries where the rate does not exceed £300 per annum. The following instances will serve to illustrate the scale of the new award:—Power-house engineer, £290; assistant power-house engineer, £260; assistant surveyors and assistant construction engineers (exclusive of allowance), £275; first-grade draughtsmen, £250; draughtsmen, 21 years of age, £160. An important clause in the award provides that any assistant engineer or any person having the degree of Bachelor of Engineering or the diploma of engineering issued by the University of Queensland shall be paid a salary of not less than £210 per annum,

Fuel Economy in Germany.—The twenty-fifth general meeting of the German Union of Electricity Supply Undertakings was recently held in Berlin, when among the papers read was one by Herr Kreyssing on "Improved Gasification of Coal and By-product Recovery, and its Importance for Electricity Supply Undertakings."

Northampton Polytechnic Institute.—On January 19th the annual prize distribution took place at the Institute, and the Principal, Dr. R. M. Walmsley, in his report gave an account of the activities of the staff and students during the session 1916-17, which have been largely directed into channels of national importance. During the preceding session only a first-year course had been held in the Engineering Day College, but at the beginning of the new session it was found possible to carry on with both first and second year work.

The Technical Optics Department was not able to do this, even young students being called away for commercial work, but the Department was kept very busy, training women in grinding lenses and prisms, throughout the year, with highly successful results.

In some of the evening classes the number of enrolments had begun to increase again, but the demand for trained signallers depleted the telegraph and telephone classes. In the current session the total enrolments have actually increased in number. The influence of the war in taking away the senior students is reflected in the number of hours worked per head, which was 48 as compared with 70·6 in peace time.

The training of disabled soldiers and sailors has continued, and up to the end of July, 1917, eleven complete courses for training men as sub-station attendants had been given: the whole of the men trained were placed out. The records show that 53 members of the staff, 542 members and students, and 802 students have joined the Colours, and there are 104 V.A.D.'s serving in military hospitals. The Roll of Honour contains the names of 80 men who have given their lives and 172 who have been wounded. A considerable amount of experimental work has been done for the Government in the Institute.

City and Guilds of London Institute.—The report of the work of the Department of Technology for 1916-17 states that the calling-up of lads on attaining the age of 18 years had a serious effect on the attendances at classes and on the number of candidates for examinations, and the high wages paid to youths further interfered with their attendances. While the numbers enrolled showed decreases in most subjects, in mechanical and electrical engineering they were well maintained, and in several chemical subjects and in iron and steel manufacture increases were recorded.

In Electrical Installation Work the examinations were held for the first time on the revised syllabus; it is remarked that the practical tests indicated that the tools which well-equipped schools should have possessed for working in electric light tubing were often wanting, and, on the whole, the practical work was unsatisfactory. The need for adequate equipment of the electrical workshop, as well as the electrical laboratory, is impressed on the education authorities.

This subject was taught at 38 centres (a decrease of 10); there were 704 students in attendance, and 121 candidates, of whom 67 passed. In Electrical Engineering, taught at 101 centres (a decrease of 7), there were 3,529 students and 1,064 candidates, of whom 663 passed (against 367 in 1916).

Institution and Lecture Notes.—Allen West Engineering Society.—At the fortnightly meeting of the above Society in Brighton, on January 22nd, a lecture was given on "Auxiliary Machinery of Rolling Mills," by Mr. James Calderwood, of Messrs. Wellman Seaver Rolling Mills, Ltd. The lecturer dealt with the design and construction of such auxiliaries as screwdown gear, manipulators, live roll, &c., and traced the course of an ingot, through the blooming rolls and finishing rolls to the hot saws. The objects of this Society are primarily the instruction of the staff and foremen of Messrs. Allen West & Co., Ltd., but in view of the general interest of such a lecture, a number of Messrs. Allen West's customers and friends residing within easy reach of Brighton, were invited. This experiment proved very successful, and appreciation was expressed by the visitors.

Other papers already read this session before the Society are:—"Theory of Motor Starting," by Mr. R. P. Bossom; "Motor Starters and Drum Controllers," by Mr. A. Harrison; "Lifting Magnets," by Mr. F. N. Pickett; "Liquid Controllers," by Mr. H. Brooke; and "Contactor Equipments," by Mr. L. Wise.

Papers by prominent engineers are to be read before the Society on such subjects as Steel Works Charging Machines, Overhead Cranes and Printing Machines, and Messrs. Allen West will be pleased to send invitations to any of their friends if they will write the Hon. Secretary of the Society, Mr. F. N. Pickett, at Brighton.

Association of Engineering and Shipbuilding Draughtsmen.—A meeting of the members of the Merseyside Branch of the Association was held on Saturday last, at the Angel Hotel, Liverpool. Mr. J. D. Murray, president of the branch, occupied the chair, and gave an interesting account of the Delegates' Conference recently held in Manchester. Mr. D. Spencer, vice-president, referred to the gratifying increase in the membership, and the excellent work done by the Merseyside Branch.

A short address was given by Mr. J. E. Jolley, secretary of the Manchester Branch, who spoke of the magnificent progress made by the Association in its efforts to advance the interests of the profession. He pleaded for a level-headed, but vigorous policy, and pointed out the success of the Association depended entirely upon each man doing his utmost for the cause at every available opportunity. An excellent musical programme was given under the direction of Mr. Percy Dalziel. It was announced that a series of lectures would be given during the remaining winter months, under the auspices of the Merseyside Branch, and the first would be by Mr. G. G. Dobie, B.Sc., at the Ranelagh Hotel, Birkenhead, on the 31st inst.

Manchester Association of Engineers.—Last Saturday, Mr. L. Rothera, B.Sc., read a paper on "Rolling Mills and the Electric Drive."

The Strikes in Germany.—In connection with the reported strikes in Germany, a "Wireless Press" dispatch, dated Amsterdam, January 29th, says:—"The Allgemeine Elektricität Gesellschaft in Berlin has closed its doors."

A Reuter dispatch says:—"The big strike has not materialised. In a few factories only a section of the workmen did not come to work, but a complete stoppage of work does not appear to have occurred anywhere. Amongst the works where a partial stoppage is reported are those of the Ludwig Loewe, the A.E.G. (General Electric Co.), the Borsig, and the Daimler."

The *Times* correspondent at Amsterdam, in a dispatch dated January 30th, says:—"The great majority of the workers are working at the Berlin works of the A.E.G. At the Herungsdorf (?) and Johannisthal works the situation is more threatening, as the majority of the workers there have 'downed tools' About 8,000 workers have struck at the Daimler works and the factories of the firms of Beck & Co. and Fritz Werner at Lichtenfelde."

A Central News correspondent at Amsterdam says:—"Amongst the latest accessions to the ranks of the strikers are 13,000 workers at the factories of the A.E.G. at Hennigsdorf (?) (one report says Honnigsdorf) and Johannisthal, 5,500 at the Schwartzkopf works, 7,000 at the Borsig works, 9,000 at the Auer works, 9,500 at the Goertz factories, and 4,000 at the Westphalian mines."

Appointments Vacant.—Mains foreman for the Burgh of Wishaw electricity works; two assistant overhead linesmen for the Rochdale Corporation tramways; shift engineer (58s. 3d.) for the Stockton-on-Tees Corporation Electricity Works; shift engineer (63s.) for the Eccles Borough Electricity Department; head of the Electrical Engineering Department of the Loughborough Technical Institute (£300). See our advertisement pages to-day.

Inquiry.—The makers of "Pulleystone" are asked for.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—At a meeting of the Electric Supply Committee of the Birmingham Corporation, Mr. FRANK FORREST was appointed chief assistant electrical engineer in the electric supply department. There was 95 applicants for the post. Mr. Forrest has held the position of sub-stations engineer in the City of Birmingham electric supply department for the past 12 years.

The Dover Electricity Committee has recommended that the salary of the electrical engineer, Mr. L. WOODMAN, be increased from £425 to £500 a year.

Barnsley T.C. has increased the salaries of Messrs. A. C. DENNIS and K. BEESON, shift engineers at the electricity works, from £2 10s. to £3 per week, this to include war bonus.

The Ilford U.D.C. Staff Administration Committee recommends that the salary of Mr. A. H. SHAW, the electrical engineer and manager, be increased from £500 to £600, by two annual increments of £50.

Walthamstow U.D.C. Light Railways Committee has recommended that Mr. T. EVANS, of Walthamstow, be appointed to the position of traffic superintendent at £150 per annum, without war bonus, with a maximum of £200 per annum.

General.—A social and musical evening was held on January 24th at the Douglas Hotel, Manchester, by the staff of the British Westinghouse Co.'s supply department. During the evening Mr. Ellam, assistant manager of the department, announced that the main purpose of the gathering was to show their appreciation of Mr. GIBSON, their manager, who had so ably organised and developed the supply business that it was now recognised as one of the most prosperous departments of the company, and after being their chief for 11 years, they thought it high time that they should show their appreciation in some tangible form. Mr. Ellam, tracing the inception of the department up to its present satisfactory position, pointed out that this success was mainly due to the able way in which Mr. Gibson had managed the affairs of the department, and referred to the cordial relationship which had always existed between Mr. Gibson and his staff. On behalf of the staff, he asked Mr. Gibson to accept a silver tea and coffee service suitably inscribed, and hoped he would long be spared to continue as their chief. In reply, Mr. Gibson said that the success referred to was, in his opinion, due to the co-operation of the staff themselves. The spirit of hearty co-operation had enabled them to clear away the difficulties that had arisen since the war, with the result that 1917 had been a record year for the department.

The wedding took place at Blackpool, last week, of Mr. G. A. Jordan, manager of the British Electric Detonator Co., St. Helens, and Miss Florence Gertrude Whitehead, of North Shore.

We have received from Miss S. Chance a copy of a 36-page pamphlet, giving personal and touching reminiscences of her father, the late Mr. A. M. Chance, of Birmingham, to whose death we referred several months ago. The references to his humane and religious devotion to the interests of his employés and his general contribution to the public good are of more than ordinary interest just now, when it is so desirable to bring master and man closer together. Copies of the pamphlet are obtainable by post (7d.) from Messrs. Cornish Bros., New Street, Birmingham, or from Miss Chance, at 11, Victoria Park, Weston-super-Mare.

Sir Henry Norman, M.P., has been appointed to be an additional member of the Air Council.

Major H. W. Devey, of the Metropolitan Railway electrical staff, is at present employed as second-in-charge of large military work in this country. This officer was called up on August 4th, 1914, and served at Suvla Bay until the evacuation, when he was mentioned in dispatches. He afterwards served on the Western Frontier of Egypt, where he acted as Commanding Royal Engineers at Solloun.

Mr. L. Frayne Boyes, for some time chief outside representative for Scotland for the General Electric Co., Ltd., and well known in Clyde shipbuilding circles, subsequently representing the British General Electric Co., Ltd., of Australasia in Adelaide, South Australia, is now Investigator and Assistant to Advisers, Priority Permits Branch, New-Zealand Munitions Department, Wellington.

Mr. W. A. Scott, J.P., F.C.A., has accepted a seat on the board of the Ascot District Gas & Electricity Co., to fill a vacancy occasioned by the resignation of Dr. H. J. Strong, J.P., of Worthing. Mr. Scott has been secretary of the company since 1896. Mr. H. T. Manwaring has been appointed his successor in the secretaryship.

Roll of Honour.—Major H. Richardson, general manager of the Dundee Corporation electricity supply department, has been awarded the Military Cross. Major Richardson has been on active service in France since June, 1915, and, besides receiving the above decoration, has been twice mentioned in dispatches. He went out to France originally as Officer Commanding the Local Company of the Royal Engineers, but was promoted in September of last year to a much more responsible position there.

Two employés of Stafford Corporation gas and electricity department, Corporal J. Holmes, R.E., and Private W. Rowley, R.A.M.C., have distinguished themselves by brave conduct on the battlefield. The former has been awarded the Military Medal, and the latter recommended for it. At a concert, attended by the Mayor and Corporation, a gold watch from the Committee, and a gold chain subscribed by employés, were handed to Holmes. It was stated that to every employé of the department who went on active service, a wristlet watch would be presented.

Lance-Sergeant R. G. Caston, Loyal North Lancs., killed in action, was employed by Messrs. Dick, Kerr & Co., Ltd., Preston.

Sergeant A. Richards, Manchester Regiment, killed in action, was formerly employed by Messrs. Charles Macintosh and Co., Ltd., Manchester.

Trooper R. E. Barnes, Household Battalion (Life Guards), who was electrician at St. George's Theatre, Canterbury, has been killed in action.

Sergeant C. Atkinson, R.E., who has died in German East Africa from malaria fever, was a wireless operator. He was on the telegraphic staff of the Midland Railway Co., at Derby.

Armourer L. J. F. Bennett, R.N., of Frome, who has died in hospital at Plymouth from pneumonia, was an electrical engineer.

Corporal V. Vidler, R.E., formerly on the staff of the Hastings Tramway Co., has been awarded the Military Medal for gallant work in Italy.

Second-Lieutenant C. W. Caswell, Middlesex Regiment, who has been awarded the Military Cross for good work in France, was with Messrs. Barnett & Sons, electricians, of Kettering.

The death in action is reported of Private G. W. Wright, Northumberland Fusiliers, aged 19, who was employed at Blackburn electricity works.

Second-Lieutenant J. W. Dugdale, Labour Corps, who has died of wounds, was for a period of two or three years the manager of the Oldham Corporation tramways. He was gazetted to the Labour Corps some months ago.

Many of our readers will desire to join with us in expressing sympathy with Mr. and Mrs. J. Snow Huddleston, of Blackheath, on the death of their eldest son, Probt. Flight Officer L. G. Huddleston, R.N., who was killed on January 22nd, aged 18¼ years, whilst flying in Lincolnshire.

Obituary.—Sir J. Wolfe Barry.—The following tribute to the late Sir J. Wolfe Barry reaches us just as we are going to press:—

"Due, no doubt, to extra pressure, the obituary notice of the late Sir John Wolfe-Barry in last Thursday's daily newspapers was closely limited to a sketch of his wide-embracing professional career. I ask, however, to be allowed to pay a humble tribute to his remarkable personal characteristics. Sir John always struck me as a peculiarly good example of the finest type of Englishman. His charm of manner and speech were, in themselves, a considerable source of attraction. There were two matters more especially which it was my privilege to periodically discuss with him. In one we were in full agreement; in the other, we took a somewhat different view—perhaps unavoidably; but our discussions were always equally pleasant under either conditions, due largely to his ready forbearance with the outlook of others (even his inferiors) and his natural breadth of mind. Sir John Wolfe-Barry was, indeed, 'great' in every sense; he was one whom we are never likely to forget—partly on account of the lasting nature of his work, but also owing to his endearing characteristics.

"Charles Bright.

"The Athenæum, *January 29th*."

Sir. A. M. Rendel.—We regret to record the death of Sir Alexander Meadows Rendel, the celebrated consulting engineer, which occurred in London last week at the age of 88 years.

Will.—The late Sir W. H. Lindley left £15,088.

NEW COMPANIES REGISTERED.

C. C. Wakefield & Co., Ltd. (149,435).—Private company. Registered January 23rd. Capital, £250,000 in £1 shares. To take over the business of oil refiners, manufacturers of and dealers in lubricating oils and appliances, &c., carried on by Sir Chas. C. Wakefield, Bart., at 30-32, Cheapside, E.C., and elsewhere, as C. C. Wakefield & Co.; also to carry on the business of exporters and importers of lubricants, chemicals, oils, and grease, shipowners, shipping agents, shippers, &c. The subscribers (each with one share) are:—Sir Chas. C. Wakefield, Wakefield House, Cheapside, E.C., manufacturer; W. R. Graham, Wakefield House, Cheapside, E.C., manager; I. Browne, Wakefield House, Cheapside, E.C., secretary. Sir Chas. C. Wakefield is permanent governing director, subject to holding half the issued share capital. Qualification of ordinary directors, £1,000 shares. Solicitors: Bristows, Cooke & Carpmael, 1, Copthall Buildings, E.C.

Pebco Accumulators, Ltd. (149,429).—Private company. Registered January 22nd. Capital, £1,000 in 1s. shares. Electrical engineers, manufacturers of and dealers in electrical apparatus, &c. The subscribers (each with one share) are:—A. J. Adams, Dennett Villa, 25, Canterbury Road, Croydon, retired; E. F. Ablett, Kintyre, Balgores Lane, Squirrels Heath, Essex, A.M.I.Mech.E.; B. de Quincey, 21, Cannon Street, E.C., solicitor. The first directors are to be appointed by the subscribers. Registered office: 11, Queen Victoria Street, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Brilliant Arc Lamp & Engineering Co., Ltd.—Charge on proceeds of munitions contract, dated January 11th, 1918, to secure all moneys due or to become due from the company to London & South-Western Bank.

Leon Cornelis, Ltd.—Assignment of £1,182 book debts, dated January 15th, 1918, to secure £1,237 to the Robert Banking Co., Ltd., 265, Strand, W.C. (Note: The Robert Banking Co., Ltd., are directors of this company.)

Siemens Bros. & Co., Ltd.—Trust deed dated January 15th, 1918, to secure £1,330,000 debenture stock, charged on the company's undertaking and property, present and future, including uncalled capital, as a second floating security (subject to £150,000 4 per cent. debenture stock secured by deed of 1900). Trustees: C. C. Macrae and C. B. Crisp.

CITY NOTES.

The Melbourne Electric Supply Co., Ltd.

Mr. J. B. Braithwaite presided at the annual meeting on Monday. He said that their local director in Melbourne, the Hon. Agar Wynne, was recently elected a member of the Legislative Council of Victoria, and was now a Cabinet Minister. The year had been an exceptionally difficult one, partly owing to the coal strike in Australia, partly owing to the Daylight Saving Act which was passed but which was subsequently repealed, and partly owing to the increasing difficulty of obtaining and shipping plant and materials and the ever-rising cost of the same. The 6,000-kw. set which he mentioned last year as having been delayed was now completed. A portion of it had already been shipped to Australia and the remainder would probably be dispatched some time next month. When that reached Melbourne, where Mr. Clements, the general manager, had made all arrangements for receiving it, they would feel comparatively comfortable as to the amount of plant they had available. In spite of the strikes and other difficulties, Mr. Clements in his report gave a fairly encouraging view of the general prospect of things in Australia. A matter which the directors had had under consideration during the year was that of the double payment of income tax. He and Mr. Lane, the secretary, had both been serving on a committee which had been formed to deal with the grievance. They had held several meetings and obtained various interviews with the Government, and as a result the Imperial War Conference had passed resolutions which ought to go a long way towards remedying the injustice of which they complained. With regard to the balance sheet, the directors had thought it prudent in view of the increasing difficulties of raising capital here to finance the company for two or three years ahead. They took the matter up early in 1917, and they placed in the United States 1¼ million five-year 6 per cent.

general mortgage convertible gold bonds redeemable in 1922. They realised £256,850 at a cost of £18,435, the difference between par and the price actually netted for them. They considered that that capital would enable them to carry on to the year 1920, so that made their minds quite easy in regard to the possession of the capital required for the development of their ever-increasing business. They now had £180,000 of capital in hand ready to meet capital expenditure during the next two or three years. The miles of streets supplied and the new consumers connected were increasing satisfactorily. Last year he pointed out that the tendency was for their existing mains to "thicken out," that was to say, they were obtaining an additional number of consumers on existing mains, which naturally avoided the expense of laying new lines, and rendered the capital already expended more productive. They now had a total of 600 miles of streets in which their mains were available, only 33 of which were added last year, showing an 18 per cent. reduction on the number added in 1916. That meant that they were gradually reducing the new mains that they had to put in year by year to meet the increasing demand upon their supplies. Mr. Clements hoped the present year would show a still further reduction. No less than 61.5 per cent. of the total capital expenditure in connection with the Melbourne undertaking was outside the power house—a most gratifying feature, and a proportion which was almost exactly reversed in the case of British undertakings. The maximum demand on the power-house had increased from 9,000 KW. to 10,500 KW. The consumers at the end of the year totalled over 32,000, which was a remarkably fine figure. There was no London company that could show the same figures. The County of London Electric Supply Co. had the largest number of consumers of any of the London companies, and they did not quite reach that figure. The number of consumers added during the year, in spite of war conditions, was 4,429, a really remarkable result, and very little below that which they had attained in the two or three years immediately preceding the war. There had been an increase of 20 per cent. over that of the previous year in connections for power purposes. The number of H.P. in motors connected was 3,612. The average size of the motors now connected to their mains was 7.3 H.P.; at one time the figure was only 3 H.P. For private lighting they now had 17,297 KW. connected, showing an increase during the year of 12 per cent. They sold for private lighting 5,952,459 units, an increase of 14 per cent. For public lighting they had added 277 KW., an increase of 8 per cent., and they had sold 610,125 units, an increase of 14 per cent. For power supply they had 23,718 KW. connected, an increase of 17 per cent., and they sold 19,571,480 units, an increase of 18 per cent. Other apparatus showed an increase of 21 per cent. in KW. connected, and 36 per cent. in the units sold, and bulk supply showed an increase of 34 per cent. in connections and 36 per cent. increase in the sales. In every case the increase in the percentage of units sold had exceeded the proportion of increase in the KW. connected, showing that those who were responsible for the technical policy of the company were investing the capital wisely and well. Taking their output altogether they had now got 51,309 KW. connected, an increase of 16 per cent., and last year they sold 28,395,000 units, an increase of 19 per cent. for the year. That, he thought, they might consider a very satisfactory state of affairs. Those figures would appear to show that they were doing their duty to the population which they served, and it might well be supposed that they would be left alone, but it would seem that the way in which the company had been developed, and the liberality with which they had treated their consumers of all classes, was increasingly attracting the cupidity of the State and Municipal authorities. It would be within their recollection that when in 1899 they sold to the Melbourne City Corporation the plum of their then business—their mains and undertaking within the city boundaries—the consideration offered them was the statutory power to supply electric light and power in the principal suburbs of Melbourne for a period of 25 years without competition from the municipal authorities. They were thus set the task of building up what was practically a new business over an area of approximately 74 square miles. To that task they at once bent their energies, but during the first few years the shareholders, both preference and ordinary, had to go without dividends, and it was not until 1906 that their gross profit exceeded £10,000, and it was not until 1911 that they were able to recommend the first modest dividend to the ordinary shareholders of 2½ per cent. Since that time, by judicious capital expenditure and a liberal policy towards their consumers, they had made steady and continuous progress, until, on August 31st, 1917, they had expended on the Melbourne undertaking alone close on £1,200,000, and were giving a supply in 598 miles of streets to 34,142 consumers. Their concession had eight more years to run, and they would suppose that, after their long wait for any return on their investment, the shareholders would be allowed to reap the reward of their enterprise and courage undisturbed. Unfortunately, however, that was not the case, and during the last two or three years especially they had had to meet powerful attacks. First, a Bill, called the Greater Melbourne Bill, was brought forward, which if passed would have handed their undertaking over to a municipal authority at six months' notice. That Bill was defeated, but in the following year was revived under a slightly different form, but it again failed to become law. During the year under review a General Tramways Bill was introduced, which sought to confer upon a Tramways Trust to be created the power of compulsory purchase of their Melbourne undertaking upon only six months' notice being given, and upon terms of compensation which, in the opinion of the directors, were entirely inadequate. That Bill, if carried, would, in the opinion of the board, have constituted what amounted to a breach of the contract into which they had entered with the Government in 1899. It would also have presented the absurd spectacle of the entire electric supply in the suburbs of Melbourne being under the control of a tramway authority, while the supply inside the city proper would have remained under the control of a body created purely for electric supply. Fortunately, that Bill met with little or no support, and was withdrawn by the Government. He mentioned those matters because some hundreds of their shareholders were domiciled in Victoria, where they had an opportunity of exerting the influence they possessed to prevent the serious injustice proposed to be done to them. As mentioned in his speech last year, they were, and always had been, ready to consider taking a supply in bulk either from the Victorian Railway's power house now in course of construction, or from any power house that might be erected for the purpose of developing the large deposits of brown coal which existed in the vicinity of Melbourne, but they did claim that, having entered into a solemn statutory contract in 1899, which they on their part had done their utmost to loyally carry out, the Government on its side should adhere to its part of the contract, and not attempt to interfere with or cut short their already limited connection. As a representative of British capitalists, he could only say that if the Australian State Governments continued to attack private enterprises which were operating under powers which those Governments had themselves conferred, they would render it impossible for them to raise capital for further developments in Australia. The recent action of the Queensland Government in the matter of the Brisbane Electric Tramways Co. was another case in point, and one which, even if defeated, would leave a very nasty taste behind it, and would not soon be forgotten. They had hitherto supposed that in a British Colony, at any rate, a Government's word was as good as its bond, and on the strength of that belief the bulk of the capital needed for the development of Australia had been subscribed; but let that confidence once be shaken, and it would not be soon or easily restored.

Mr. Benjamin Brookman seconded the motion, which was carried unanimously.

Following the re-election of the directors and auditors, a vote of thanks was passed to the local board and the managing director in Melbourne, and the staff and employés.

Adelaide Electric Supply Co., Ltd.

Mr. J. B. Braithwaite, presiding on Tuesday at the annual meeting, said that the continuance of war conditions had resulted in increased difficulty in obtaining and shipping plant and materials and in a rising cost of the same. They had also had the Daylight Saving Act to contend with, an Act which the manager estimated cost them in revenue £2,300. The Act had since been repealed. There had been an unusual number of industrial troubles in South Australia, although he was happy to say that they had never had a strike or a dispute of any kind with their own employés. Amongst other things, there was the big coal strike, which for some time held up supplies of coal, and at one time the position was so acute that the Government instructed them to disconnect certain of their power consumers in order to reduce the consumption of coal, and that had naturally affected their revenue to some extent. In spite of all those facts, the year's operations could fairly be considered as not unsatisfactory, the gross profit having been increased by £8,083, equal to 9.5 per cent. Of the increase in expenses, £5,961 was due to generating costs, almost entirely increased cost of coal. The result must be regarded as very creditable to the local board and staff in South Australia. They had a general reserve fund untouched of £60,000; they had a premium account of £25,425, which could at any time be applied to depreciation if the need arose; and they had their dividend equalisation account of £25,000 still untouched, a portion of which was invested outside the business. That fund was built up some years ago for the purpose of tiding them over any difficult year that might arise, and one would not have been surprised if during the war they had been obliged to have recourse to that account to maintain the dividend; but they could congratulate themselves that they had been able to pull through without touching that money. The general opinion in South Australia was that after the war very great industrial developments were likely to take place in the Port Adelaide district, which was about nine miles from Adelaide. They had been seriously considering the whole position for some time past, and they were quite prepared when the proper time came to put down a power station at Port Adelaide, and probably transfer their main generating station there, where they would have an ample supply of water for condensing. Whenever that time came it was possible that during the period when the Port Adelaide station was being erected there would be a time during which the capital so employed would not have commenced to earn revenue, and the dividend equalisation account would come in very handy in such a case. In regard to the current financial year, they received a cable a few days ago from the local chairman

giving them the results of the first four months' working—that was to the end of December. The revenue for that period had amounted to £50,150, as against £44,475 last year, an improvement of about £5,500, while the expenditure for the same period had been £24,850, compared with £22,805, with the result that the profit for the four months stood at £25,300, as against £21,670 for the corresponding period last year. A Royal Commission which had inquired into the question, had reported unanimously against the municipalisation of either the South Australian Gas Co. or the Adelaide Electric Supply Co., so they might indulge the hope that they would be left free to continue the developments of their undertaking. Having referred to the prospective settlement after the war of the vexed question of the payment of double income-tax, the chairman, in conclusion, said that the capital expenditure during the current year was not likely to be heavy, but in order to meet it the local board suggested that, as they could not get leave to make an issue of capital, they would endeavour to obtain the sanction of the Commonwealth authorities to the issue of debenture stock on the local market, and inquiries were being made in that direction.

Mr. R. Percy Sellon seconded the motion, and the report was adopted.

Compagnie Générale d'Electricité.

M. Azaria, who presided at the recent annual meeting, in Paris, of the Compagnie Générale d'Electricité, replied at length to questions put privately as to why the company only maintained profits on the level of those realised prior to the war, whereas the manufacturing work carried out since the beginning of the war had been very considerable, and should have been accompanied, it was contended, by an exceptional increase in the profits. Quoting from the statutes, the chairman stated that the company was formed primarily for the supply of light and power, and that the subsidiary companies constituted for this purpose represented the strength and prosperity of the parent company until 1914. Owing, however, to the rise in the cost of raw materials, particularly coal, combined with the contract limitations on the sale prices of energy, the profits of the subsidiary companies in a few months were converted into losses, one having had a loss in 1915-16 of £72,000, a second £34,000 in 1916-17, and a third £33,000 in 1916-17. By developing the manufacturing works, however, the parent company had been able not only to meet the deficit arising from the supply stations, but also to increase the profits to a level slightly greater than that attained in peace time. The only sacrifice imposed upon the shareholders had been to reduce the dividend by one-half in two consecutive years, or, rather, to pass the dividend for one year. The company had been able to raise the dividend to 10 per cent., which was the same as in the last year of peace. The company was not a war creation, but essentially one of peace, and the speaker ridiculed the idea of the so-called fabulous profits which were attributed to many war undertakings, excepting those having a practical monopoly or possessing manufacturing secrets and patents. In the case of the Compagnie Géneralé, the average net profits in 1916-17 did not reach 5 per cent. of the value of the turnover, and although the dividend was 10 per cent. on the nominal value of the shares, it only amounted to 7 per cent. on the average price paid for the 70,000 ordinary shares. The accounts approved by the meeting show that the net profits in 1916-17 were £162,000, as compared with £139,000 in the previous year, exclusive of the balance brought forward, and the dividend is 10 per cent. on £1,000,000, and 5 per cent. on new capital of £400,000.

East London Railway Co.—The report states that the passengers carried last year numbered 9,172,734, against 9,363,822, exclusive of season-ticket holders. There has been a large proportionate increase in the issue of season tickets. At the average rate of 1.27d. for each passenger the traffic from this source alone should now yield approximately £51,700 per annum, without taking into account the increase of 50 per cent. on some of the fares. In accordance with the undertaking given at the last annual meeting, the chairman placed himself in communication with the Treasury to endeavour to obtain some mitigation of the effect of the rules imposed by the Government upon railways under their control in respect of capital expenditure which had not fructified prior to the end of 1913 as applying to the case of the electrification of the railway. Protracted correspondence resulted in the refusal of the Treasury to accede to this request. The net result of this ruling is that, though the general public have enormously benefited by the expenditure in electrifying the line, the shareholders are penalised to the extent of upwards of £3,000 per annum, and will continue to be penalised in respect of the interest on electrification capital until the end of the period of Government control.

Metropolitan Railway Co.—Dividend upon the ordinary stock for the past half-year at the rate of 1 per cent. per annum, making 1 per cent. for the year, carrying forward £16,000, after placing £20,000 to the general renewals fund. Dividend on the surplus lands stock at the rate of 2½ per cent. per annum, carrying forward £2,500, after placing £3,000 to the reserve account.

Greenwood & Batley, Ltd.—Interim, 7½ per cent., free of tax, on the ordinary shares.

The British Trade Corporation.—The first report of this Corporation shows that during the brief period of its operations a small profit was realised. At December 31st last, the amount of capital issued was £2,000,000. Since the issue of the prospectus in June last the management has been principally engaged in making the necessary arrangements for representation in foreign countries and other business details. It has, however, already been able to render some assistance in connection with overseas trade. Evidence given before various Parliamentary Committees pointed to the desirability of making arrangements for the insurance of commercial credits, and the corporation has in hand a scheme for giving effect to this object. An information bureau has been established. Gross profits amounted to £17,614, of which current expenses, including salaries, rent, rates, office and other charges absorbed £7,943, leaving a net profit, before providing for income-tax, of £9,671.

Stock Exchange Notice.—The Committee has ordered the following to be quoted in the Official List:—

Newcastle-on-Tyne Electric Supply Co., Ltd.—371,881 additional 5 per cent. preference shares of £1 each, fully paid (Nos. 912,333 to 1,284,213).

Montreal Light, Heat & Power Co.—Dividend, 2 per cent. on the paid-up capital stock for the quarter.

Westminster Electric Supply Corporation, Ltd.—Dividend at the rate of 9 per cent. for the year ended December 31st.

City of Buenos Aires Tramways Co. (1904), Ltd.—Balance dividend, 1s. 3d. per share, making 5 per cent. for 1917, less tax.

STOCKS AND SHARES

Tuesday Evening.

The principal market in the Stock Exchange showing any noticeable dulness is that for gilt-edged issues, where prices sag under the influence of a crumbling in the price of the 5 per cent. War Loan, due, of course, to the big subscriptions obtained by the victorious Tanks in the provinces. Most of the general business centres around industrials, and since we last wrote, further attention has been drawn to the shares of the electrical manufacturing companies to the accompaniment of a revival of rumours expecting what may be likely to happen in regard to this group. The Brisbane Electric Tramways matter is once more the hub of vigorous discussion, and the assistance of the Stock Exchange Committee has been invoked to add force to the protest lodged against what are regarded as confiscatory proposals on the part of the Queensland Government in connection with the terms upon which the company is to be taken over.

Well-known firms laid the whole position before a sub-committee of the Stock Exchange, and the latter undertook to bring it to the attention of the full Committee at an early date. The protestors would like to see the authorities in Queensland plainly informed that, if the Brisbane Electric Tramways terms are changed on the lines proposed by the Queensland Government, any further issue made by the Colony, either of Government stock or otherwise, would receive anything but a welcome reception from the London market. There the matter rests for the moment.

Reference was made some time ago to the surprise felt in London in regard to the placing by the Metropolitan Electric Supply Co. of a substantial line of stock in the provinces, without its being offered in the first place to certain houses in the Metropolis. Whatever grievance was felt arose from the fact that the Metropolitan Electric is a London concern, and that in the past it has received support, willingly accorded, from supporters in London. The aggrieved parties considered themselves badly treated when the company placed its latest stock with a group in the provinces, and there may be an echo of this feeling lurking in this week's legislation of the Stock Exchange Committee, which forbids a member of the London Stock Exchange to grant commission concessions to provincial brokers if the latter are shareholders in a concern called the B.S.T., Ltd., so long as this carries on business within the London postal area. The B. S. T., Ltd., is, according to the latest-filed particulars at Somerset House, an undertaking comprised almost exclusively of stock-brokers in various provincial centres, and, although it does not deal actually in stocks and shares, the London Stock Exchange Committee regard the principle of its foundation as sufficiently competitive to make them pass the resolution we have summarised.

Manufacturing shares make a good showing, with a sharp rise in Edison Swan as the outstanding feature. The £5 shares are 7s. 6d. up at 50s., and the £1 shares have risen to 30s. 3d., while British Westinghouse Preference at 2 13/16 are 3/16 higher. Cromptons have improved to 17s. British Insulated Ordinary at 3½ stand ¼ higher. Of the cable shares, Callenders and Henleys are 5s. and 10s. up both at 15 and 17 respectively.

Not very long ago a line of shares in Siemens Brothers and Co., Ltd., passed into the hands of the Public Trustee at a price round about £3 per share. We believe that some technical difficulty exists in the way of dealing in the shares, but news reaches us from the

North that buyers are willing to pay 70s. and over, and that a few shares have changed hands on this basis. The nominal value of the shares is £5 fully-paid.

Telegraph issues are firm, with small improvements in Anglo-American Telegraph Preferred and Deferred, Eastern Extensions and a bigger rise in West India and Panama shares. The last-named are 5s. up to 33s. 9d. In answer to inquiries in the market as to what had brought about this sharp recovery, the foolish reply was "only buying." Chile Telephones have improved to 7¼, and United River Plates to 7. Marconis are a better market, with Americans up to 24s. 9d. on hopes of a good report which should be out in a couple of months' time.

In the Home Railway market, Metropolitans went back to 22¾, notwithstanding the dividend, or perhaps because of it, because, as we pointed out before, the Ordinary stock looks over-priced from the yield aspect as compared with the Surplus Lands stock, which pays substantially more. Underground Incomes are ½ down at 81½. An important scheme is proposed for construction of a deep-water wharf at Canvey, and the railway system in connection with it is estimated at 6½ miles in length, to be worked by electric power from a generating station to be erected at Canvey Island. The share and loan capital of the company is to be £1,333,333, and the time stated within which to complete the proposed works is five years from the passing of the Act.

The Rubber market remains dull and heavy, although the shrinkage in the price of the raw material has been somewhat checked. Base metal shares are steady, and prices in the Chemical group after their recent bout of strength have subsided to a slight extent.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1915.	Dividend 1916.	Price Jan. 29, 1918.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	10	9	6¼	—	£6 18 6
Charing Cross Ordinary	5	5	4	—	6 5 0
do. do. do. 4½ Pref.	4½	4½	8¾	—	6 13 4
Chelsea	4	3	2⅞	+ ⅛	6 4 4
City of London	8	8	13⅜	—	6 0 9
do. do. 6 per cent. Pref.	6	6	10⅜	—	5 18 6
County of London	7	7	11⅛	+ ⅛	6 5 10
do. 6 per cent. Pref.	6	6	10⅜	—	5 18 6
Kensington Ordinary	7	6	5⅝	—	5 11 7
London Electric	3	Nil	1	—	Nil
do. do. 6 per cent. Pref.	6	4	8¼	—	5 6 8
Metropolitan	3	3	3⅛	—	4 12 4
do. 4½ per cent. Pref.	4½	4½	8½	—	6 13 4
St. James' and Pall Mall	8	8	7	—	5 14 6
South London	5	5	3	—	6 13 4
South Metropolitan Pref.	7	7	21/8	—	6 10 6
Westminster Ordinary	7	7	6⅛	—	5 5 8
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	95½	+1	6 5 8
do. Def.	33/6	1½	23¾	+ ½	6 7 8
Chile Telephone	6	6	7½	+ ⅛	5 10 4
Cuba Sub. Ord.	5	7	9½	—	*7 11 4
Eastern Extension	8	8	15¼	+ ¼	*5 6 0
Eastern Tel. Ord.	8	8	150⅜	—	*5 6 4
Globe Tel. and T. Ord.	7	7	14½	—	*4 19 1
do. Pref.	6	6	10⅜	—	5 17 1
Great Northern Tel.	22	24	36	—	6 11 6
Indo-European	13	13	51½	—	6 5 3
Marconi	10	15	3¼	—	4 16 1
Oriental Telephone Ord.	10	10	3¼	—	3 4 0
United R. Plate Tel.	8	8	7	+ ½	*5 14 4
West India and Pan.	6d.	6d.	1¾	+ ¼	*2 19 2
Western Telegraph	7	8	15½	—	*5 5 0
Home Rails.					
Central London, Ord. Assented	4	4	6⅜	—	6 8 0
Metropolitan	1	1	22⅞	— ½	4 8 0
do. District	Nil	Nil	15⅜	—	Nil
Underground Electric Ordinary	Nil	Nil	1½	—	Nil
do. do. "A"	Nil	Nil	5/8	—	Nil
do. do. Income	6	4	81½	— ½	*4 18 2
Foreign Trams, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	4⅞	—	6 3 1
Anglo-Arg. Trams, First Pref.	6¼	6¼	2⅛	+ ⅛	—
do. 2nd Pref.	6¼	—	3⅜	—	—
do. 5 Deb.	5	5	66	—	7 11 6
Brazil Tractions	4	4	44	-2	—
Bombay Electric Pref.	6	6	92	—	6 4 4
British Columbia Elec. Ry. Pfcs.	5	5	43	—	11 12 4
do. do. Preferred	Nil	Nil	28⅛	—	Nil
do. do. Deferred	Nil	Nil	28	—	Nil
do. do. Deb.	4½	4½	68	—	7 6 7
Mexico Trams 5 per cent. Bonds	Nil	Nil	37	—	Nil
do. 6 per cent. Bonds	Nil	Nil	3⅛	—	Nil
Mexican Light Common	Nil	Nil	17⅛	—	Nil
do. Pref.	Nil	Nil	29	—	Nil
do. 1st Bonds	Nil	Nil	88	+1	—
Manufacturing Companies.					
Babcock & Wilcox	15	15	8¼	—	4 12 4
British Aluminium Ord.	7	10	1⅛	—	6 9 9
British Insulated Ord.	17½	20	8¼	+ ½	6 3 2
British Westinghouse Pref.	7½	7½	2⅛	+ 1/16	5 6 9
Callenders	20	20	15	+ ½	6 13 4
do. 5 Pref.	5	5	4	—	6 5 0
Castner-Kellner	22	20	8⅜	—	6 1 3
Edison Swan, fully paid	—	—	2¼	+ ⅛	Nil
do. do. 4 per cent. Deb.	4	4	75⅛	—	5 6 0
Electric Construction	7½	7½	14	—	6 13 4
Gen. Elec. Pref.	9	9	10⅜	—	5 15 8
do. Ord.	10	10	19	—	5 5 3
Henley	25	25	17	+ ½	7 7 4
do. 4½ Pref.	4½	4½	4	—	5 12 2
India-Rubber	10	10	14⅞	—	*6 15 7
Telegraph Con.	20	20	42	—	*5 14 3

* Dividends paid free of income-tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, January 30th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/6	..
a Ammoniac Sal	per ton	£75	..
a Ammonia, Muriate (large crystal)	"	£58	..
a Bisulphide of Carbon	"	£38	..
a Borax	"	£38	..
a Copper Sulphate	"	£67 10/-	..
a Potash, Chlorate	per lb.	2/6	..
a " Perchlorate	"	2/-	..
a Shellac	per cwt.	£15 15/-	15/- inc.
a Sulphate of Magnesia	per ton	£16	..
a Sulphur, Sublimed Flowers	"	£35	..
a " Lump	"	£32	..
a Soda, Chlorate	per lb.	1/-	..
a " Crystals	per ton	170/-	60/- inc.
a Sodium Bichromate, casks	per lb.	..	..
METALS, &c.			
c Brass (rolled metal 2" to 12" basis)	per lb.	..	..
c " Tubes (solid drawn)	"	..	..
c " Wire, basis	"	..	..
c Copper Tubes (solid drawn)	"	1/6½ to 1/7½	..
g " Bars (best selected)	per ton	£147	..
g " Sheet	"	£147	..
g " Rod	"	£147	..
d " (Electrolytic) Bars	"	£125	..
d " Sheets	"	£152	..
d " Wire Rods	"	£133	..
d " H.C. Wire	per lb.	1/3½	..
f Ebonite Rod	"	3/-	..
f " Sheet	"	3/6	..
n German Silver Wire	"	2/3	..
h Gutta-percha, fine	"	6/10	..
h India-rubber, Para fine	"	2/7½	½d. dec.
i Iron Pig (Cleveland warrants)	per ton	Nom.	..
l " Wire, galv. No. 8, P.O. qual.	"	£42	..
g Lead, English Pig	"	..	..
g Mercury	per bot.	Nom.	..
e Mica (in original cases) small	per lb.	6d. to 8/-	..
e " " " medium	"	8/6 to 6/-	..
e " " " large	"	7/6 to 14/- & up.	..
d Silicium Bronze Wire	per lb.	1/6½	..
r Steel, Magnet, in bars	per ton	..	..
g Tin, Block (English)	"	..	..
n " Wire, Nos. 1 to 16	per lb.	4/-	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

The Electric Furnace for Melting Ferro-manganese.—At a meeting of chemists in Sweden, J. Harden stated that the electric furnace was particularly suitable not only for the production of ferro-manganese, but also for melting it; the use of the crushed solid alloy is apt to give rise to "ghost lines" in the steel, a serious defect owing to the hardness of these spots, which renders the steel unsuitable for machining, so that it is far better to add the alloy in the molten state, ensuring its diffusion through the body of the liquid steel. The ease of control of temperature afforded by the electric furnace, and the avoidance of loss of material which it ensures, render this the best means of melting the alloy. Any type of furnace will serve, but the induction type is the most economical. The cost of operation is about 20s. per ton of ferro-manganese. In addition to the even temperature maintained, there is a considerable economy of time and material, important items, especially with ferro-manganese at its present price of £75 per ton.

Corrections for the Pentane Lamp.—We have received from the Electrotechnical Laboratory of the Department of Communications, Tokyo, Japan, a pamphlet on the correction factor for water vapour in the use of the pentane lamp, by Messrs. K. Takatsu and M. Tanaka. A large number of experimental data are given, and the authors conclude that the complete formula for their pentane lamp (made by Chance Bros., and certified by the N.P.L.) as checked against the Ediswan-Fleming lamp (also certified by the N.P.L.) is:—

$$I = 10{\cdot}0_2 + 0{\cdot}063_2 (8 - e) - 0{\cdot}008\ (760 - b),$$

where I = the candle-power, e the litres of water vapour per m.³ of air, and b the barometric pressure in mm. of mercury. This result is practically identical with that obtained by Messrs. Paterson and Dudding at the National Physical Laboratory in 1915, but Messrs. Rosa and Crittenden at the Bureau of Standards, in 1914, obtained the value 0·0057 instead of 0·0063 for the water vapour correction factor. The authors by experiment have found that the use of a ventilating hood and duct above the lamp reduces the candle-power materially; such a device was employed at the Bureau of Standards but not at the N.P.L., and the candle-powers measured at the Bureau were much below the normal value. The authors consider that the discrepancy was due to the use of the ventilating device, and suggest that the same cause may account for the lower correction factor obtained at the Bureau.

Exports and Imports of Electrical Goods during October, November and December, 1917.

The official returns of electrical export and import business for the last three months of the past year, show, under the adverse circumstances, a surprising firmness in export values, while the import totals have been steadily mounting upwards during the past five months. The export totals have been: October, £345,363; November, £326,884: and December, £322,615; and these compare with the three preceding months as follows: July, £394,339; August, £393,882; and September, £288,956.

The export figures call for no particular comment. Machinery exports reached average values, while in October and November, telegraphic and telephonic exports reached considerable proportions, submarine cable to the value of £42,000 being included in the former month, and of £44,000 in the latter. In December, battery exports reached a high level.

The electrical import values for the three months under review were: October, £224,475; November, £254,644; and December, £294,883, these comparing with £218,741 in July; £179,994 in August, and £210,237 in September.

It will be noted that machinery imports attained considerable proportions in November, and especially in December, while all three months have seen increasing battery imports, and in addition a revival of lamp importation, the December glow lamp total reaching £17,517.

The re-exports of foreign and Colonial electrical material has been on a small scale during the three months, the values being: October, £14,296; November, £5,206; and December, £9,541.

Exports and Imports of Electrical Goods and Machinery, October, November and December, 1917.

	October.			November.			December.		
	Exports.	Imports.	Re-exports.	Exports.	Imports.	Re-exports.	Exports.	Imports.	Re-exports.
Electrical goods and apparatus unenumerated	£65,214	£53,697	£2,899	£41,680	£48,856	£2,062	£51,667	£37,962	£3,707
Insulated wire and cable (not telegraphic or telephonic)	11,394	1,749	5,308	14,378	1,966	100	23,299	1,669	3,823
Electric glow lamps	10,278	6,083	808	9,379	7,341	290	6,784	17,517	1,085
Arc lamps and parts (not carbons)	4,569	10,680	20	3,692	7,321	—	1,022	2,789	—
Meters and instruments	11,853	4,588	2,485	10,084	2,853	684	9,112	411	167
Electrical machinery (including switchboards and transformers)	137,612	113,283	1,154	127,276	131,577	1,241	141,860	195,341	727
Batteries	10,481	30,107	—	7,557	40,734	40	34,417	35,252	20
Carbons	565	3,098	467	701	7,520	226	790	2,259	12
Telegraph and telephone wire and apparatus...	93,399	1,190	1,155	112,137	6,476	563	53,664	1,683	—
Totals	£345,363	£224,475	£14,296	£326,884	£254,644	£5,206	£322,615	£294,883	£9,541

NOTES ON WELDING SYSTEMS.

By CAPT. JAMES CALDWELL, M.I.E.E., R.E.

(*Abstract of paper read before the* Institution of Engineers and Shipbuilders in Scotland.)

(*Concluded from page* 79.)

Typical Plants.—A self-contained plant for electric welding consists of a prime mover of some kind driving a generator of electrical energy in the form required for the process to be used, and of sufficient output.

For portable plants a petrol or oil engine has the advantages of lightness, small bulk, and requiring little attention. For stationary plants the choice of prime mover is mainly dependent upon economical considerations. In any case, the driving engine should be well governed, and have some reserve power, so that it will not drop speed seriously upon a temporary overload.

The type of generator used must be alternating current for resistance methods, and continuous current for carbon arc methods. For metal arc welding either continuous or alternating current may be used, continuous for choice. The generator should be self-regulating, with a wide range of load, so that the voltage will not fall excessively with momentary large currents. This can be ensured by compound winding in the case of continuous-current machines. The load fluctuations are greatest when only one welding apparatus is served, so that good governing and regulation are of greatest importance for such use, and interpole machines are preferable.

The larger the number of welders in simultaneous use, the more closely the total power needed will approximate to the sum of the average, so that large installations providing for many welders are relatively less costly in regard to power plant than small installations with only a few welders.

If the apparatus is to be connected to a general supply, with direct current, the most important factor to be considered is the supply pressure. Steadying and regulating resistances in series with the arc are necessary to limit the current flowing. A supply at from 100 to 110 volts should be available to overcome the variable resistance of the liquid flux, although less pressure is sufficient to maintain the arc with both carbon and metal electrodes. When the general supply pressure is from 200 to 250 volts it is necessary to use a motor-generator set, *i.e.*, a 100/110-volt dynamo driven by a motor fed from the general supply; or when the pressure is to be halved, a reducer set may be employed comprising two motors of 100/110 volts connected in series, with the welding current taken from the terminals of one machine. The losses by such conversion should not exceed 20 per cent. of the energy actually used by the welders if the use is reasonably continuous.

If the welding current is taken direct from a three-wire system, the supply should only be taken from the "middle" to one "outer" conductor when carbon arc welding is intended, the work, of course, being connected to the middle wire, which should be positive and earthed.

With the metal arc it is not so important to insist on the earthed work negative, which would be the correct connection in that case.

For resistance welding from D.C. supply, a motor-generator must be used, the generator giving an alternating single-phase current. The supply pressure is not important.

With alternating-current supply, single-phase, if the supply pressure is at, or about, 100 volts, it can be connected directly to arc welders with only the necessary regulating resistance in series. If the supply pressure is above 100 volts, it is advisable to transform it to that pressure for metal arc welding, using a static transformer with separate windings and rated for intermittent working. For resistance welding the supply pressure is not material. Each welder has its own transformer, which can be wound on the primary side for any supply pressure.

In the case of a three-wire two-phase distribution, a single-phase supply can be obtained from the two outers. This loads each phase equally, but reduces the "power factor" of the system, as the currents in the outers are out of phase with the voltage in each log, and this may be objected to by the supply authority.

Alternatively, each welder may be connected to one outer and the inner conductor (or to a single-phase transformer if the supply pressure is not suitable for direct use), exactly as in the case of a three-wire continuous current system. Such connections are certain to produce some out-of-balance current between the two phases, which will be in greater proportion the smaller the number of welders connected.

It is not quite so simple to obtain a single-phase current from a three-phase supply as from a two-phase, inasmuch as a transformer must be used with its secondary windings connected up in a particular way. This connection gives currents largely out of phase in opposite senses in two of the phases, which is objectionable both from the production of out-of-balance voltage and the lower power factor resulting.

Welders can also be connected to the separate phases, each of which yields a single-phase current, but the objection to unbalanced loads has to be met.

Before deciding to utilise public supplies on either the two- or three-phase systems for welding installations of any magnitude, it is wise to consult the supply authorities and obtain their assent to the connections to be used.

When continuous current is necessary, as in carbon arc welding, a motor generator must be used to convert the alternating-current supply to continuous.

If the supply is generated on the premises, or supplied through a transformer or motor-generator, one of the leads should be earthed, viz., that to which the work is connected, and in this case only single-pole switches on the insulated side are necessary. An ammeter of suitable range should be placed in each welder circuit.

The flexible leads to electrode-holders require some attention. The conductors should be of fine wire strands, with sufficient length, and arrangement of fittings made to permit freedom of movement without liability to kinks, and the cable protected with tough, durable material, such as "cab-tire" sheathing. In the case of carbon arcs, the last foot or two may be protected from the heat of the arc by an asbestos covering.

When power supply is small compared with the current

required for welding, it is usual to employ a substitution resistance and some automatic device to put the resistance into circuit when the arc is broken. Such a provision may be necessary for portable sets when a single welder is supplied by a small generator, as the interruption of full-load current is likely to cause sparking at the brushes and flash over, but, if possible, it is best to have a margin of power. Where a number of welders are supplied from a large machine, such a provision is quite unnecessary.

The regulating resistances used to limit the current must have a sufficient range to suit the variety of work to be done. Some parts of this resistance should be permanently in circuit, *i.e.*, the regulating switch must have no position cutting out all the resistance. This permanent resistance limits the current to a maximum independently of the operator's skill, care, and inadvertence.

The resistance should be protected so that nothing can come into contact with the current-carrying elements, but ventilated and placed in a position where the heat produced will not inconvenience the operator, or cause any fire risk. The actual resistances should be capable of carrying their rated current continuously without allowing a temperature in excess of boiling point.

Repair work requires superior skilled operators, as every job varies. The methods of fixing parts, countering the effects of expansion, ensuring correct relative position in the completed work, finishing in a workmanlike manner, all demand experience and judgment as well as operating skill. Differences of thickness, risk of damage by over-heating necessitate the man on repair work being a good all-round mechanic, acquainted with the material, construction and working of the article he is handling. For boiler and ship repairs a boilermaker is suitable; for engine and machinery repairs a fitter will be better after training with the welding apparatus. Repair work is in any case work for a skilled man, and only experience can produce a man suitable for this purpose.

Repetition work is comparatively easy, as the preparation of material, provision of fixing apparatus, &c., will have to be made just as jigs, templates, and tools are prepared for repetition machinery work. Indeed, with resistance-contact welding the operator has little to do but see to the supply of material and watch the product from time to time. As the switching on and off of the current is automatic in such cases adjustments can be made by a charge-hand exactly as tool-setting is done on automatic machine tools.

More knowledge and experience is demanded for a "general purpose" resistance-welding set, especially if the operator has to change the clamps and adjust the movement and current regulation for varying sections and sizes.

With any form of gas welding or arc welding manipulative skill has to be acquired. The correct adjustment of gas mixture, correct position of flame in respect to the work, and the welding rod in the one case; the regulation of current, proper length of arc, correct position and distance of electrode in the other, have to be learnt. Further, the operator must watch the work, know the indication of true union of the fused metals, learn to weld from the bottom upwards, how much metal can be added in each layer, the proper rate of advance and swing of the blowpipe or electrode. All this can be taught to an intelligent youth or girl in a very few weeks sufficiently to make them useful operators on a single repetition process.

Perhaps the most important qualifications are watchfulness and perception, which enable the operator to detect anything abnormal in the product or in the tool itself, and thus prevent the output of faulty work. This is particularly the case in welding where defective work may be hidden by an apparently perfect surface, and for this purpose periodic examination and testing of work are necessary. Hence, repetition work by any suitable welding process can be carried out under quite similar labour conditions to other repetition work, whilst it offers prospects of development into a skilled mechanic of the abler operators at least as good as those open to machine operators in other trades.

ELECTRIC COOKING AS APPLIED TO LARGE KITCHENS.

At a meeting of the Scottish Local Section of the Institution of Electrical Engineers, in Edinburgh, the paper by Mr. Gillott was discussed. An abstract of the paper appeared in our issues of December 21st and 28th, 1917.

Mr. C. G. Nobbs said that it might be taken under present conditions that electrical maintenance was about one-quarter that of large coal and steam cooking plants. With regard to load factors, it was essential to give quick service; this entailed comparatively high current ratings to ovens, boilers, &c. With well constructed apparatus the running load was only 25 per cent. of the full-load rating. In the case of restaurant type ovens, the full load might be on for 15 to 45 minutes to bring the ovens to working temperatures, while the running load might be on for hours according to the weight of the joints. There was, however, a large diversity factor which tended to increase the load factor. From the great similarity of the load curves given in the paper, one might think these had been selected. From personal experience of cooking schemes, the diversity factor was large, menus varied from day to day for individual installations, and there was also a wide variation in the class of restaurant and the daily menu. Until such time as the supply authority could take on all classes of consumers, it was quite feasible to select or arrange with consumers to give a high resultant load factor and flatten out the curves of diversity. For example, a communal kitchen would complete its cooking at, say, 7.30 to 10.30 a.m., when the cooked food was sent out to distribution centres or handed over the counter at the kitchen. A scheme which he had to deal with recently would cater for 40,000 to 50,000 meals daily, and it was quite feasible in that case so to arrange the menu that roasting and baking work might be done at any time the day before upon a restricted-hour basis. Meat pies and such like might be arranged so as to be suitable for heating up. Potatoes and green vegetables must be cooked on the same day as they were used, and this could be done, with, in fact, most of the cooking, between 7 and 10 a.m. A combined electrical and steam plant for an individual communal kitchen could easily be arranged to give a load factor of 50 to 70 per cent. Apart from this it would be seen that the deep valley in the author's curves between 7 and 10 could be filled in. For individual installations working under normal conditions, the maximum demand seldom exceeded 50 per cent. of the total current rating. In fact, for some jobs with which he had been connected, the transformers installed were but 50 per cent. of the total wattage rating of the cooking plant. An oven he designed for a 50 per cent. load factor for baking 500 loaves per hour, and installed in 1912, gave a temperature rise from 50 to 425 deg. F. in one hour, 600 in two hours, and maintained a gradually rising temperature from 425 deg. at half load. The consumption varied from 1/10 to 1/12 of a unit per loaf, according to the class of bread baked. Mr. F. Fletcher, at the London discussion, mentioned the "desirability of standardisation of electric heating elements, so that they may be obtained as readily as lamps." He quite agreed, but it was not advisable to carry standardisation too far at this present comparatively early stage in electrical cooking, as progress in design might thereby be handicapped. There was no reason why dealers should not stock manufacturers' standardised elements or renewal parts locally in order to save the delay in transit from the makers. Experienced care was necessary for the fitting of renewal elements, and such work should be done by local contractors or hiring authorities. It would be understood that even were elements made as simple to renew as the ordinary incandescent lamp, it was very doubtful whether they would induce the average cook to put her head into the oven, much less attend to screws and nuts, or investigate a breakdown. Where an establishment such as an hotel, restaurant, or institution employed a resident engineer, he would carry the requisite stock of renewal elements. Co-operation between supply authorities, factors, contractors, and manufacturers was most essential for the propagation or organisation of national sales campaigns, for the collection of technical data, education of the public, &c. It was necessary that each supply or hiring authority, apart from advisory committees, should employ a competent man or men accustomed to meeting caterers, chefs, architects, and the like. Purely electrical men seldom made efficient salesmen. Personally, he preferred to train men having had experience in coal, gas, and steam cooking upon the simple electrical data necessary. There was ample scope for consultants in cooking to advise caterers, architects, supply authorities, contractors, &c., upon large schemes, and to answer to 101 questions that arose upon efficient service, load and diversity factors, and tariffs.

Mr. Hardie (Glasgow) gave Glasgow's experiences. With regard to staff cooking, they equipped the first all-electric canteen in Scotland fully a year ago. It was of 56 kw. capacity, designed for 250 workers. It had been an unqualified success. At the moment they were completing three all-electric installations, one for 100 people, 45 kw.; one for 250 people, 70 kw.; and one for 500 people, 137 kw. They had, in addition, an 80-kw. electrical cooking equipment at a large hospital with 300 wounded soldiers and a staff of nurses and servants. The apparatus had been in use for two years, and the average daily consumption was 130 units, or 0.37 unit per person per day. The boiling and heating were all done by steam. In a Government factory in the West of Scotland there was an electrical equipment in four kitchens aggregating 350 kw., where the plant had been running satisfactorily for over a year. Here, also, the boiling and steaming were done by steam. Personally, he was an optimist on the subject of electric cooking, and agreed with the author that the field for electric cooking, and also for industrial heating, had only so far been scratched. If the business was properly handled electricity supply authorities had in electric cooking and heating a source of revenue second only to that derived from power. He was in agreement with the author on the substitution of self-contained element apparatus for boiling, which still continued to be the weak spot in electrical equipment. They had been standing still for years, and it was time they got a move on.

Mr. Smith (Greenock) said that there they had given favourable terms for cooking for almost nine years, the rate being ¾d. per unit, which had only recently been increased by 10 per cent. They had been seriously handicapped in their early attempts by certain classes of apparatus. They had one or two partly electrical kitchens in shipyards, and these had

been fairly satisfactory only. The principal defect with the cookers had been in the hot-plate, but the electric grill and baking plate were the most popular pieces on the market, and in restaurants and bakeries had given satisfaction. He suggested that manufacturers should experiment with radiant heat plates instead of the flat-surface cast-iron hot-plate. As to the design of the cooker, he thought it a good plan to have fuses in every element. They in Greenock had had apparatus giving out owing to line earth leakage due to the elements getting wet. He suggested that the problem of putting more than 250 volts on cooking apparatus should be dealt with in the next edition of the Institution Wiring Rules. He thought there might be two separate cookers, one on each side of the three-wire system, while the oven with top and bottom heat was very much superior to the oven with side elements. He did not think the question of first cost should have much effect on the question of the installation of large cookers, and municipalities should offer suitable terms, including maintenance. They had found the hiring scheme for heaters and cookers satisfactory.

Mr. Henderson pointed out that they had found that electric heating had raised the problem of steam. It would be desirable to have some arrangement for abstracting the steam in the form of water at atmospheric pressure, and using the incoming cool air to condense the water. That problem arose in applying electric heating to biscuit baking.

Mr. Mears (Edinburgh) admitted that his experience of electric cooking had been small, but the results had been excellent. The boiling water difficulty still existed, and he suggested that ordinary utensils should be abandoned and self-contained apparatus installed, so as to improve efficiency and prevent breakdowns.

Prof. Bailey (Edinburgh) agreed that the field for electric cooking was large, but he was afraid the average private consumer would be slow in coming on. The first cost was serious to a private person who did not have the turnover which took place in large-scale cooking.

In the course of his reply, Mr. Gillott held that electrical apparatus to-day was reliable. He had been doing electrical cooking for eight years, and the first breakdown had still to happen. In Newcastle there were nearly 300 installations of domestic apparatus. Two men could keep the whole plant running with no fear of being called out at night for repairs. The cost of apparatus for private houses was about £1 a year, and the cost of energy varied from £2 to £4. The average price of cookers was about £15; this was sufficient to cook for eight persons. In his own case, he gave particulars of cost in the Institution *Journal* for 1914, and he then showed that for lighting, heating, and cooking in the house, with four adults and three children, the annual bill, including coal, was £20, or a saving of £4 10s. a year. He was able to run a house of 10 rooms with one maid doing all the work. That represented a saving of £60 a year, as otherwise an additional maid would have been necessary. That alone should be sufficient to induce private people to go in for electric cooking. He did not see why an ordinary ironmonger should not be able to keep a stock of standard elements. Each element must be of the same loading. Larger apparatus would only require more elements, so that the total load of the oven would not present any difficulty. He agreed that the sales engineer should be more than this designation implied. Replying to Mr. Hardie, the author said they supplied energy at ¾d. per unit. At a recent meeting of the directors of the firm of caterers he spoke of in his paper, a resolution was passed expressing their satisfaction with electric cooking, and giving instructions for the catering engineer to look into the question of extending the electrical equipment throughout the whole of their branches. The saving of labour to the firm had been enormous; they knew what the ovens could do, the heat value of electricity was constant, and the same results were always obtained. The hot-plate trouble was not so acute as some people made out. He had found no difficulty in actual working with the voltage, and Mr. Smith's proposal to have two ovens each on 250 volts would mean the ovens being several feet apart, which in practice would be unworkable. He disagreed with Mr. Mears that there was no scope for electric cooking in Edinburgh. If the hotel keepers and restaurateurs were interested they would get the business. With gas at 2s. and electricity at ¾d., the fuel costs were equal. In connection with intallation "A," the manager told him that he removed 3 to 4 lb. of fat from each grill; that saved £1 a day. He gave another figure which Mr. Nobbs could confirm. A caterer doing 700 grills per week paid 6s. for electricity, and recovered 16 lb. of fat, which he sold at 9d. per lb. The grill brought them in a revenue of several pounds sterling per week. In these jobs there was no difficulty about running cost.

Metropolitan Association of Electric Tramways Managers.—A meeting of the members of this Association was held at the Municipal and County Club, Whitehall Court, Whitehall, S.W., on Friday, 18th inst., when there were present:—Messrs. Ullmann (East Ham), Slattery (West Ham), Goodyer (Croydon), Hammond (Met. Elec.), Mason (South Met.), and Mackinnon (London United). Letters of regret at their inability to be present were received from Messrs. Harvey (Ilford), Murray (Walthamstow), Stokes (Bexley Heath), Williams (Erith), and Schofield (Leyton). Various matters of interest were discussed.

REVIEWS.

Miniature Electric Light. Edited by B. E. Jones. London: Cassell & Co., Ltd. Pp. 156. 141 figures. Price 1s. 3d. net.

The introduction of the metal filament lamp, which extended the possibilities of electric lighting so widely, immensely facilitated the task of the amateur who wished to set up his own little installation, and in this he was also aided by the development of the small portable accumulator, largely due to its use for ignition on automobiles. But even with the primary cell a great deal can be done with the small tungsten lamp, and this little book, due to contributors to *Work*, will be found very useful by those who have occasion to provide themselves with electric light on a miniature scale.

It commences wisely with a warning that it *must* be miniature, for the running costs of a more pretentious scheme would be exorbitant. After some elementary explanations with regard to primary and secondary cells, circuits, &c., the various types of lamps available are described, with their accessories. The arrangements of lamp circuits, the respective merits of primary and secondary batteries, methods of installation, &c., are then discussed in detail, and various useful applications of small electric lamps are described, after which some hints for home-made accessories are given. The construction of fairly large primary batteries is minutely explained, and a chapter on accumulators follows. Naturally there is some overlapping and duplicating owing to the different sources from which the matter is derived, but this is a minor fault, and the book as a whole thoroughly covers the ground intended.

The Theory of the Submarine Telegraph and Telephone Cable. By H. W. Malcolm, M.A., Ph.D., D.Sc. London: *The Electrician* Printing and Publishing Co., Ltd. Pp. xi + 565. Price 18s. net.

Telegraph and telephone engineers have for long felt the need of a work which would enable them to follow the phenomena associated with the transmission of telegraphic signals or speech over cables. And although several writers have dealt with certain theoretical aspects of the problems, and others have applied their conclusions to practical conditions, yet it is probably a correct estimate of the present position to say, with Dr. Malcolm, that, apart from the researches of Heaviside, very little information could be found available for those who desired to understand the phenomena underlying the working of the submarine telegraph cable.

The original articles, of which the present work is an assemblage, with other additional matter added, appeared in serial form in the pages of a contemporary in 1912, and it will gratify many who were interested in these articles to refer to them now in their present convenient form.

The book is divided into five sections, which deal respectively with introductory matter, periodic phenomena, transient phenomena, methods of telegraphic transmission, and the future progress of cable telegraphy.

The introductory part will be found exceedingly useful, inasmuch as it provides in a brief recapitulatory form the various mathematical processes made use of throughout the succeeding chapters, such as the exponential series, hyperbolic functions, complex quantities, and determinants.

The remainder of the section deals with resistance, inductance, and capacity, and an investigation into the growth and decay of currents in circuits possessing these properties individually and collectively. The author at this point urges upon the student the necessity of clearly apprehending the fundamental difference between telephony and telegraphy—the periodic nature of the former and the transient nature of the latter, as it was the attempt to apply the transient theory to telephony that "led to the imposition of the K.R. law, by which the progress of long-distance telephony was retarded."

The methods of loading cables are fully treated in Chapter V, and formulæ for calculating the effective resistance and inductance of a loading coil are worked out. Interesting comparison is made between continuous and coil-loaded cables.

Chapters VI and VII are devoted to discontinuities and reflections and alternating-current measurements. A brief, but excellent, description of the Franke high-frequency generator, and of the Drysdale-Tinsley A.C. potentiometer is also given.

Chapter VIII will be of special value to telegraph engineers, whose interests have been somewhat neglected by the disproportionate attention bestowed by investigators on purely telephonic problems. As Dr. Malcolm points out, the problem of determining the electrical state of the cable at any point and time is one that has hitherto produced solutions of particular cases, but it is capable of complete mathematical and numerical solution, and this he proceeds to demonstrate.

The insufficiency of the K.R. law as laid down by Kelvin is pointed out, and expressions are given for the "arrival curve" when the data are applied to the San Francisco-Honolulu cable. An important contribution is made in this chapter to the theory of leaks, and the increase of speed in working which the existence of a leak secures.

Chapters XI and XII deal with the various methods of telegraphic transmission, particularly that of the sine-wave form.

Chapters XII and XIV discuss the distortion of signals in cables and the methods of overcoming it. Descriptions are given of the Orling and the Heurtley relays. Chapter XV deals with the duplex cables, and Chapter XVI with the loaded telegraph cable.

In conclusion, the author discusses the future of ocean telegraphy, and of the possible competition from the field of "wireless." Reminding the reader that it is on the attenuation constant, and not on the K.R. of the cable, that speed of working depends, he is convinced that, given the exact electrical constants, the telegraph cable of the future can be so designed that at least as great an advance may be hoped for as in the case of telephony, "where such an altogether disproportionate increase in efficiency has been attained without increase of cost."

The volume, as a whole, is indicative of painstaking and careful work, and will unquestionably be welcomed by every telegraph and telephone engineer in this country who is interested in the theory underlying the practical work for which he is responsible. The symbols employed are those of the practical telegraph man—not those of the academic textbook. The excellent curves, illustrative of the mathematical results, enable one clearly to visualise what is happening under the given conditions.

Useful appendices furnish the reader with statements of the principal formulæ employed, and tables of effective resistance, inductance, and impedance of standard apparatus, &c., are given. On page 333 "thory" should be "theory," and on page 375 "unchanged" should be "uncharged." The exponents of a number of the expressions throughout the book are badly mutilated, particularly where the solidus is used. The same applies to integration limits.—A. F.

The Elements of Electrical Engineering. By William S. Franklin. London: The Macmillan Co. Price $4.50.

Volume I. Direct and Alternating Current Machines and Systems. Pp. 465 + x. 368 figures.

This volume, the first of a trio dealing with electrical engineering problems, is by an American author already well known to engineers in this country. In the preface it is described as a first course in electrical engineering, covering both direct and alternating-current systems. As a matter of fact, though the greater part of the volume deals with elementary work suitable for such a course, there are some sections of a more advanced character, and which would only form part of a more advanced study.

The book is, speaking generally, characterised by rather more freedom from convention than is usual in English works; this is certainly no disadvantage. Thus we find a preliminary note giving an account of the functions of the various technical societies of America, engineers being urged to join one or more of these. The physical aspect of electrical engineering is also more emphasised than in books issued on this side of the ocean. Throughout the book the bias is strongly towards the machine side of the subject; there is no consideration of such matters as lamps, illumination, cables, or wiring, and instruments are only referred to in a casual manner from time to time.

The first section of the book deals with general principles, chief stress being laid on magnetic work, which is clearly and adequately considered. There is, however, a very interesting chapter on the electron theory, leading up to an account of the use of the electric valve as detector, amplifier, and generator in wireless telegraphy and telephony. In view of the rapid increase in our knowledge of the electron, it has now become essential that qualified engineers should have some knowledge of the subject, and the presence of this chapter may be taken as a sign of the times.

The next section deals with direct-current machines, almost solely from the point of view of operation, little being included with regard to constructional points. There is, however, an appendix dealing with armature windings, though this is of a purely theoretical character, the question of the arrangement of the winding in slots, a most important practical point, not being considered.

The third section deals with the elementary theory of alternating currents, the treatment differing little from that usually adopted in this country.

The concluding section deals with alternating current machines, alternators, converting plant, motors (including induction, synchronous, and commutator types), and transformers being considered.

The treatment throughout the book is clear and accurate, and a special compliment may be paid to the numerical examples which occur (with answers) at the ends of most of the chapters. These are of a varied, and often of an original, character, and if carefully worked will necessitate a considerable amount of thought on the part of the student.

The diagrams are clear and useful, and the only criticism to be made is that when a device, as a field magnet, is illustrated, it is often of a very old pattern. There seems no reason why the point under consideration should not be indicated by a modern arrangement.

The book can be particularly recommended to that large class of men, who, having good practical experience, desire to improve their theoretical knowledge.

NEW PATENTS APPLIED FOR, 1918.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and 6 Liverpool and Bradford.

706. "Arrangement of hoisting chains and gear for lifting electrode arms of electric furnaces, &c., and tilting gears and trolley for same." T. A. Mackereth & J. H. Twidell. January 14th.

776/777. "Electro lifting magnets." Steel, Peech & Tozer and H. E. Bowen. January 14th.

787. "Constant-flow gravity-feed apparatus with electric control for steam generators." J. H. Assink-Spaink. January 14th.

790. "Tools for manipulating shade-holding ring of electric lamps." A. Watkins. January 14th.

809. "Electric welding systems." British Thomson-Houston Co. (General Electric Co., U.S.A.) January 14th.

833. "Tramcar, &c., under-carriages." F. H. Critchley. January 14th.

834. "Tension regulators and microphones." A. Marr. January 15th.

839. "Battery case for miners' electric lamps." A. B. Connolly. January 15th.

855. "Operating electric switches from a distance." A. H. Francks and Telephos Domestic & Street Lighting Co. January 15th.

861. "Electric fans." British Thomson-Houston Co. (General Electric Co., U.S.A.) January 15th.

901. "Sparking plugs." H. G. Longford, W. W. Longford & Sphyns Manufacturing Co., & W. A. Clark. January 16th.

945. "Manufacturing lead linings for accumulator boxes, cistern boxes, &c." J. W. Claughton & W. G. Claughton. January 17th.

951. "Self starters for internal-combustion engines." B. Brooks & W. Holt. January 17th.

958. "Machine switching telephone exchange systems." L. Polinkowsky and Western Electric Co. January 17th.

963. "Automatic telephone systems." A. Rose & G. Simonetta. January 17th.

1,012. "Steadying the arc discharge in electric furnaces." H. Etchells and H. A. Greaves. January 18th.

1,031. "Electric heating apparatus." C. H. Archer, Automatic Telephone Manufacturing Co. & G. W. Simister. January 18th.

1,032. "Electric relays." Automatic Telephone Manufacturing Co. and P. T. Bates. January 18th.

1,047. "Earthing devices for electric oil-break switches." F. Coates, J. Mirrey and A. Reyrolle & Co. January 18th.

1,048. "Control of dynamo-electric machinery." J. C. Wilson. January 18th.

1,050. "Small electric installations." H. Leitner. January 18th.

1,071. "Starting and lighting systems for automobiles." J. Bethenod. June 18th. (France, June 14th, 1917.)

1,073. "Electro-magnetic relays." M. B. Richter. January 18th.

1,075. "Voltage regulating devices." J. Bethenod. January 18th. (France, April 24th, 1917.)

1,082. "Variable-speed generators and storage-battery systems." H. A. Gill. (U.S. Light & Heat Corporation). January 18th.

1,093. "Machine switching telephone systems." G. Deakin, L. Polinkowsky & Western Electric Co. January 19th.

1,109. "Wireless signalling systems." British Thomson-Houston Co. (General Electric Co., U.S.A.) January 19th.

1,121. "Ignition devices." F. W. Vickery. January 19th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1916.

13,345. Railway Signalling. M. Davies & D. C. Davies. September 20th, 1916. (112,251.)

13,483. Storage Battery Plates. A. E. White (United States Light and Heat Corporation). September 22nd, 1916. (112,133.)

13,943. Telegraph or Telephone Sets, particularly Portable or Field Sets. F. L. Cork. September 30th, 1916. (112,136.)

15,802. Telegraph Keys. C. N. de Hoedt. November 4th, 1916. (112,139.)

16,567. Apparatus for producing Perforated Strip by Electrical Current Impulses. H. H. Harrison and Creed & Co. November 18th, 1916. (112,141.)

1917.

51. Transmission Dynamometer. F. D. Everett. January 2nd, 1917. (112,169.)

584. Control Gear for Electrically-driven Cranes. W. S. Hubbard. January 11th, 1917. (112,174.)

1,146. Electric Furnaces. G. B. Filmer & J. J. Denton. January 23rd, 1917. (112,177.)

2,674. Fittings or Supporting Combinations for Electric Lighting and other purposes. J. S. Foreman and Drake & Gorham. February 23rd, 1917. (112,195.)

3,347. Spark Plug Intensifiers. O. G. Singer. March 7th, 1917. (112,201.)

3,934. Apparatus for Teaching Signalling in Morse or other Codes. F. W. Green. March 19th, 1917. (112,205.)

4,144. Magneto-electric Machines. O. Pletscher. March 21st, 1917. (112,206.)

4,335. Starting Switches for Electric Motors. British Thomson-Houston Co. & J. Sugden. March 26th, 1917. (112,209.)

9,317. Fire-detecting Wires for Electric Circuits. C. A. Harach. June 28th, 1917. (112,239.)

10,019. Electric Portable Hand Lamps and the like. N. McLean. February 2nd, 1917. (Divided application on 1,678/17.) (112,240.)

14,896. Sparking Plugs. W. H. Pease. October 15th, 1917. (112,256.)

France.—La Compagnie d'Entreprises Electro-mécaniques is the name of a new company which has lately been formed in Paris with a capital of £40,000.